70p

Win a Texas CC-40

Denmark	DKr	26.00
Germany	Dm	6.50
Greece	Dra	190.00
Holland	DFL	6.50
Italy	L	2900
New Zealand	NZ$	2.60
Singapore	M$	4.30
Switzerland	SFr	5.40

YOUR COMPUTER

MAY 1983 BRITAIN'S BIGGEST-SELLING HOME COMPUTER MAGAZINE Vol. 3 No. 5

Chasing spectres with a Spectrum

Reviews: £170 Texas CC-40 portable ZX-81 software

Dragon Tanks and a full monitor

Vic Frogger

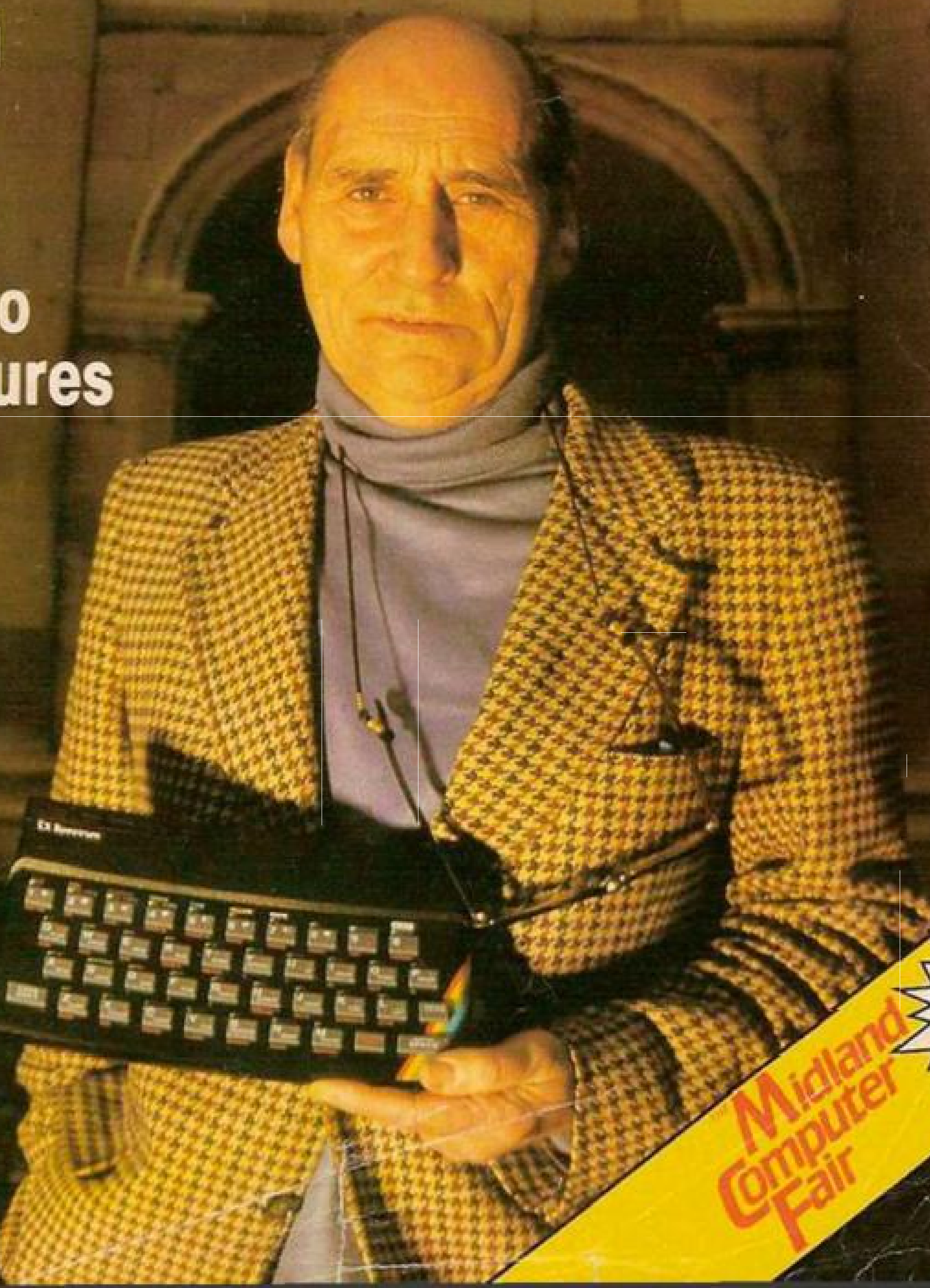
Guess the cards to reveal BBC structures

Ace screen kit

Atari scroller

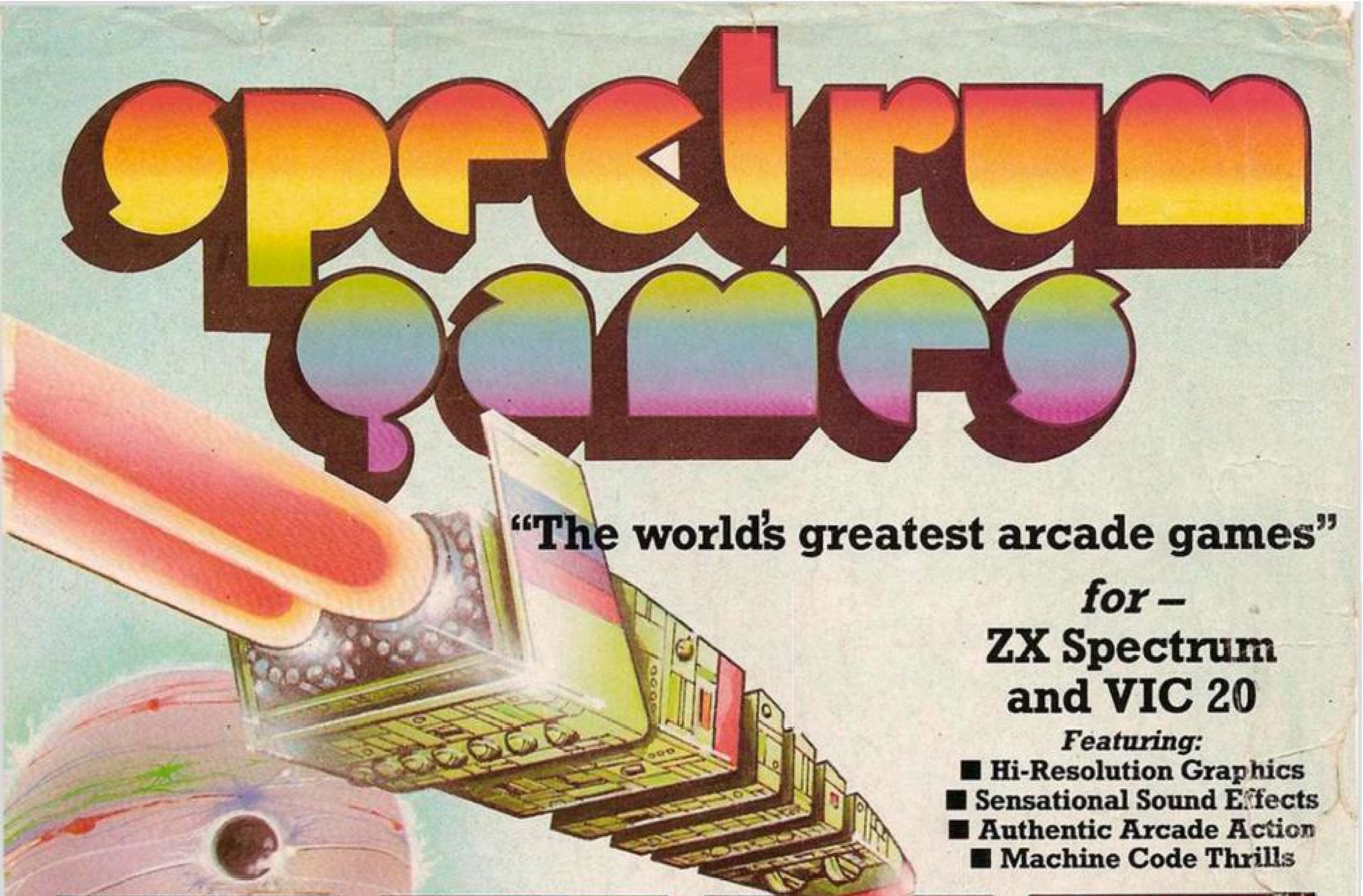
First Bytes

Plus plenty of games and features for all your home computers



Midland Computer Fair

50p admission voucher inside



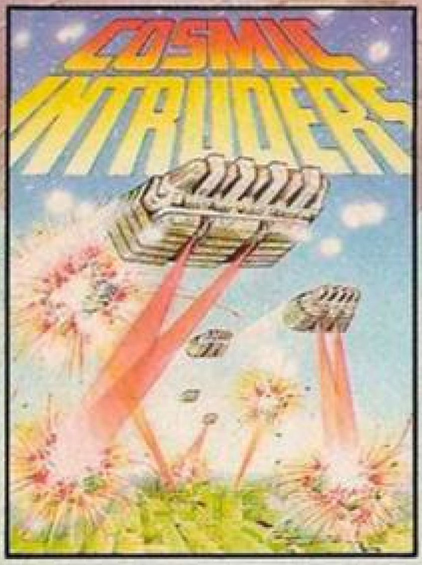
"The world's greatest arcade games"

for –

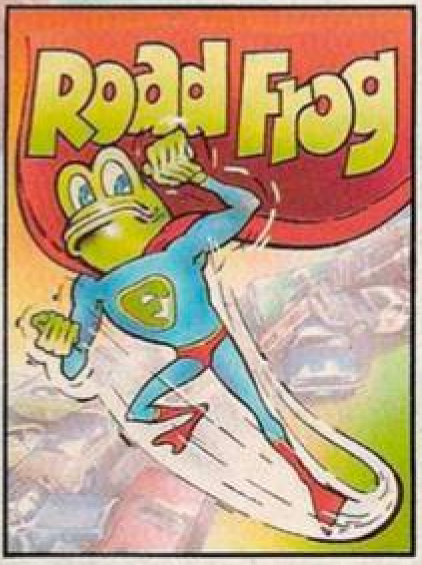
ZX Spectrum and VIC 20

Featuring:

- **Hi-Resolution Graphics**
- **Sensational Sound Effects**
- **Authentic Arcade Action**
- **Machine Code Thrills**



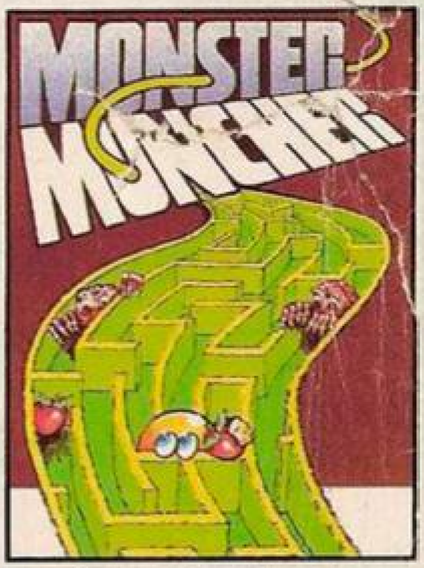
■ COSMIC INTRUDERS
The original and best intruders game with some new twists – *how long can you last?*



■ ROAD FROG
Guide Froggy across the road, then the river and finally home – *but beware the Evil Monster!*



■ ROCKET COMMAND
Speed across the planet surface to defeat the aliens and save the Human race – *smart bombs and hyperdrive to aid you.*



■ MONSTER MUNCHER
Chomp the apples in the maze before the monsters eat you – *if you can swallow the boosters you might even eat them!*

ANY GAME JUST

£5.50

Including, VAT, post & pack and OUR NO QUIBBLE REPLACEMENT GUARANTEE

SPECTRUM GAMES

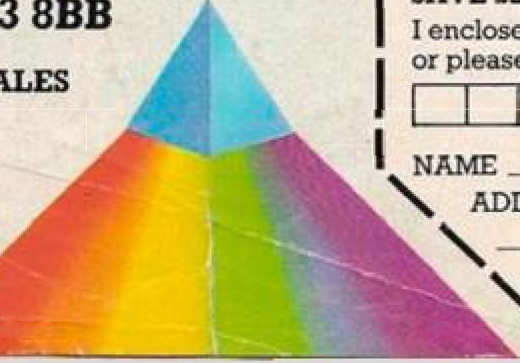
FREEPOST MANCHESTER M3 8BB

Access

INSTANT CREDIT CARD SALES LINE (24 HOURS)

061-832 9143

Dealer enquiries invited



POST COUPON NOW TO:
SPECTRUM GAMES, FREEPOST MANCHESTER M3 8BB

Please rush me a copy of –		Any ZX Spectrum	Any VIC 20
	Monster Muncher	☐	☐
	Rocket Command	☐	not available
	Road Frog	☐	☐
	Cosmic Intruders	☐	☐

SPECIAL OFFER – SAVE ON TWO –
SAVE £2.00 ON ANY TWO GAMES – PAY ONLY £9.00

I enclose cheque/P.O. for £ ____________
or please debit my Access Card No.

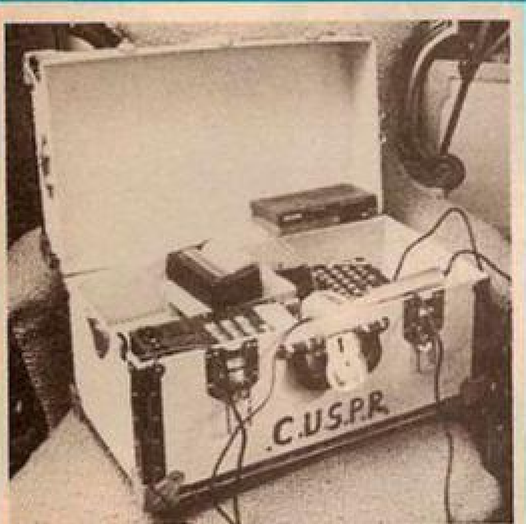
☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

NAME ____________________
ADDRESS ____________________

FREEPOST NO STAMP NECESSARY

YOUR COMPUTER Contents

MAY 1983



Ghost hunting: page 50.



ZX-81 software survey: page 42.



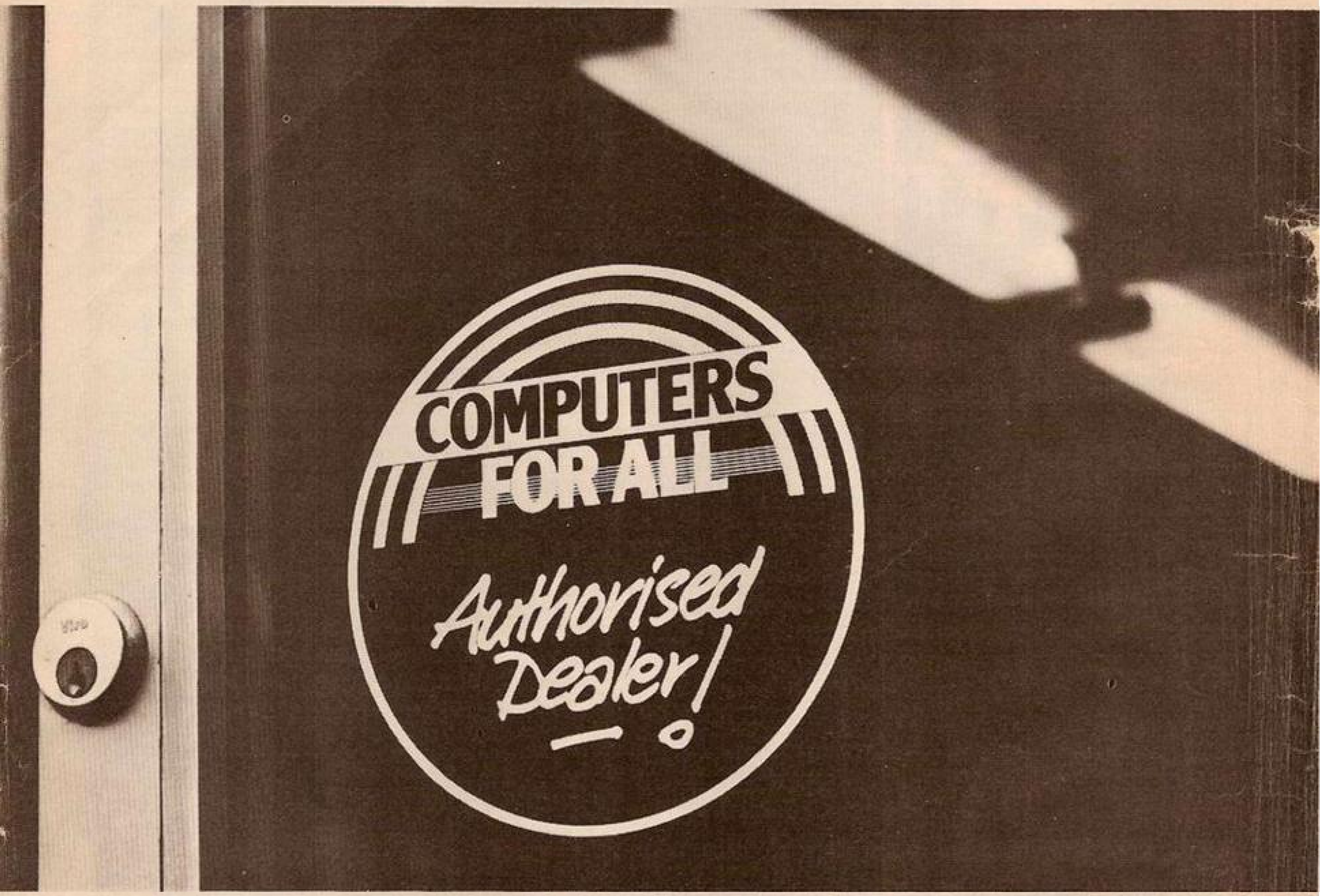
First Byters get even younger: page 38.



Sub hunt: page 78.

Cover photograph by Stephen Oliver.

IF YOU WANT PROFESSIONAL DEALER THERE'S A NEW



From now on, you won't have to look far for a totally professional home computer dealer.
Just look for the name that says it all. **COMPUTERS FOR ALL**
It's the newest and most exciting network of Micro dealers in the U.K.
The ideal places to buy, browse, seek advice and after-sales service . . . professional service!
Every COMPUTERS FOR ALL dealer is dedicated to giving you, the customer, exactly what you have always wanted . . . a shop or store that knows about computers, capable of helping you sort out what's right for your needs; expertise in giving sound advice, knowledgeable in technical matters.
If you've ever bought from the usual retailer who just stocks and sells, you'll appreciate the difference!
A COMPUTERS FOR ALL dealer is a shop where people matter . . . why not call in at your local one today. You'll get a friendly welcome!

SERVICE FROM A COMPUTER NAME TO LOOK FOR:

FRIENDLY SERVICE AND THE WORLD'S FINEST MICROS!

You'll find a wide range of popular Micros at a COMPUTERS FOR ALL dealer. **Atari 400 and 800, Sinclair ZX Spectrum, DRAGON 32, SORD M5, MPFII, Commodore 64, Oric I (48K) and BBC Micro*** to name a just few! Plus of course, the sort of dealer who can (and will) explain which one is best for your needs!



HARDWARE, SOFTWARE TOO!

A COMPUTERS FOR ALL dealer also stocks a great deal of the very best hardware and software, so that you can expand into new worlds of computing.

Everything from equipment like EPSON and SEIKOSHA printers to a fantastic new range of ATARI software direct from the U.S.A.!

Of course, you'll also find lots of other items of interest at a COMPUTERS FOR ALL dealer.

Books, BBC Software, DRAGON 32 Software . . . the list is endless!

Call now at your local shop or store.

Look for the name that says it all . . .

COMPUTERS FOR ALL



*BBC Micro available at selected dealers only.

Where to find your COMPUTERS FOR ALL DEALER

AVON

JADE COMPUTERS
Coombend, Radstock, Bath. 0761 32570.

***MERCATOR COMPUTER SYSTEMS**
3 Whiteladies Road, Clifton, Bristol. 0272 731079.

MOBILE MICROS
2 Castle Street, Thornbury, Bristol. 0454 418383.

BERKSHIRE

***KENNETH WARD COMPUTERS**
Verve House, London Road, Sunningdale. 0990 25025.

CORNWALL

***FAL-SOFT COMPUTERS**
8 St. George's Arcade, Falmouth. 0326 314663.

DEVON

***BITS & BYTES**
44 Fore Street, Ilfracombe, N. Devon EX34 9JD. 0271 62801.

COMPUTER SYSTEMS (TORBAY)
Pump Street, Brixham. 08045 6565/6.

***CRYSTAL COMPUTERS**
209 Union Street, Torquay. 0803 22699.

DORSET

DENSHAM COMPUTERS
329 Ashley Road, Parkstone, Poole.

***WEYTECH COMPUTER SYSTEMS**
20 St. Edmunds Street, Weymouth. 03057 79881.

ESSEX

***AKHTER INSTRUMENTS**
Unit 19, Arlinghyde Estates, South Road, Harlow. 0279 412639.

***COMPUTERS FOR ALL**
72 North Street, Romford. 0708 752862.

***EMPRISE LTD.**
58 East Street, Colchester. 0206 870353.

***EMPRISE LTD.**
3a Baddow Road, Chelmsford. 0245 356834.

HANTS

HOME COMPUTER CENTRE (ROSS RECORDS)
13 Kingston Road, Portsmouth. 0703 819515.

KENT

***APHROS SOFTWARE CO.**
83 Canterbury Road, Westbrook, Margate. 0843 23627.

***MEDWAY COMPUTERS**
141 New Road, Chatham. 0634 826080.

***MICRO MAGIC**
128 Erith Road, Bexleyheath. 0322 523052.

LONDON

EUROCALC
224 Tottenham Court Rd., London W1. 01-631 4139.

KAYDE HOME COMPUTERS
1 Station Approach, New Eltham, London SE9. 01-859 7505.

***KELLY'S COMPUTERMARKET**
227 Dartmouth Road, Sydenham, London SE26 4QY. 01-699 4399/6202.

MIDDLESEX

***TWILLSTAR COMPUTERS**
17 Regina Road, Southall. 01-574 5271.

N. IRELAND

D. V. MARTIN LTD.
13 Bridge Street, Belfast, BT1 1LT. 0232 226434.

NORFOLK

***CARLTON COMPUTERS**
4 Swanstons Road, Great Yarmouth, NR30 3NQ. 0493 58898.

SHETLANDS

***TOMORROW'S WORLD**
Esplanade, Lerwick, ZE1 0LL. 0595 2145.

SUFFOLK

BECCLES COMPUTERS
5 The Ridings, Worlingham, Beccles. 0502 715061.

SURREY

***ANIROG COMPUTERS**
26 Balcombe Gardens, Horley. 02934 6083.

COMPUTASOLVE
8 Central Parade, St. Marks Hill, Surbiton. 01-390 5135.

SUSSEX

THE COMPUTER CENTRE (BMS) LTD.
37d & 37e Robertston Street, Hastings, East Sussex. 0424 439190.

S. WALES

AUTOMATION SERVICES (S. WALES)
3 Wermeys Road, Penysfai, Bridgend. 0656 720959.

DAN EVANS (BARRY) LTD.
81 Holton Road, Barry, South Glamorgan. 0446 734242.

***MORRISTON COMPUTER CENTRE**
37 Clase Road, Morriston, Swansea SA6 8DS. 0792 797572.

STEVE'S COMPUTER CO. LTD.
Castle Arcade, Cardiff. 0222 41905.

WARWICKSHIRE

***IMPULSE MICRO SYSTEMS LTD.**
6 Central Chambers, Cooks Alley, Wood Street, Stratford-upon-Avon. 0789 295819.

WORCESTERSHIRE

***DEATH VALLEY COMPUTERS**
P.O. Box 54, Worcester WR2 6QA. 0905 640400.

EVESHAM COMPUTER CENTRE
Crown Court Yard, Bridge St., Evesham. 0386 48635.

COMPUTERS FOR ALL

"THE SHOP WHERE PEOPLE MATTER"



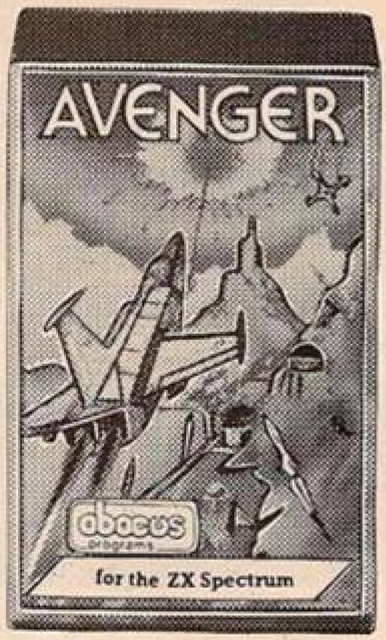
Chess
Sinclair
48K £7.95



Starship Enterprise
Silversoft
48K £5.95



Horace Goes Skiing
Sinclair
16K £5.95



Avenger
Abacus
16K £4.95



3D Tunnel
New Generation
16K £5.95



Mined-Out
Quicksilva
48K £4.95



3D Tanx
DK Tronics
16K £4.95



Arcadia
Imagine
16K £5.50

Title	Producer	K RAM	Price
Ground Attack	Silversoft	16	£5.95
Orbiter	Silversoft	16	£5.95
Slippery Sid	Silversoft	16	£5.95
Strategy Games			
Battle of Britain	Microgame	48	£5.95
Novotnik Puzzle	Phipps	16	£4.95
Chess	Artic	48	£9.45
Voice Chess	Artic	48	£9.95
Superchess II	C P Software	48	£7.95
Football Manager	Addictive	48	£6.95
Chess-The Turk	Oxford	48	£8.95
Dictator	DK Tronics	48	£4.95
Adventure			
Labyrinth	Axis	16	£5.95
Planet of Death	Sinclair	16	£6.95
Inca Curse	Sinclair	48	£6.95
The Hobbit	Sinclair	48	£14.95

Title	Producer	K RAM	Price
Ship of Doom	Artic	48	£6.95
Espionage Island	Artic	48	£6.95
Rescue	Computer Rentals	48	£5.95
The Orb	Computer Rentals	48	£5.95
Transylvanian Tower	Shepherd	48	£6.50
Utility			
M/C Code Test Tool	Oxford	16	£9.95
Editor/Assembler	Oxford	16	£9.95
Compiler	Softek	16	£14.95
Soft Talk II	C P Software	48	£6.95
Family Games			
Reversi	Sinclair	16	£7.95
Othello	CDS	16	£5.95
Golf	R and R	16	£3.75
Conflict	Martech	48	£11.95
Test Match	Computer Rentals	48	£5.95
Backgammon	C P Software	48	£5.95

Title	Producer	K RAM	Price
Draughts	C P Software	48	£6.95
Practical			
Vu-Calc	Sinclair	16	£8.95
Vu-File	Sinclair	16	£8.95
Vu-3D	Sinclair	48	£9.95
Collectors Pack	Sinclair	48	£9.95
Club Record Controller	Sinclair	48	£9.95
Address Manager	Oxford	16	£8.95
Finance Manager	Oxford	16	£8.95
Dietron	Custom Data	16	£4.75
Program Collections			
Shiva Special 1	Shiva	16	£5.95
Over The Spectrum 1	Melbourne House	16	£5.95
Over The Spectrum 2	Melbourne House	16	£5.95
Over The Spectrum 3	Melbourne House	16	£5.95

WHSMITH

Prices correct at time of going to press. Subject to availability. At selected branches only.

For the best hardware, the best software.

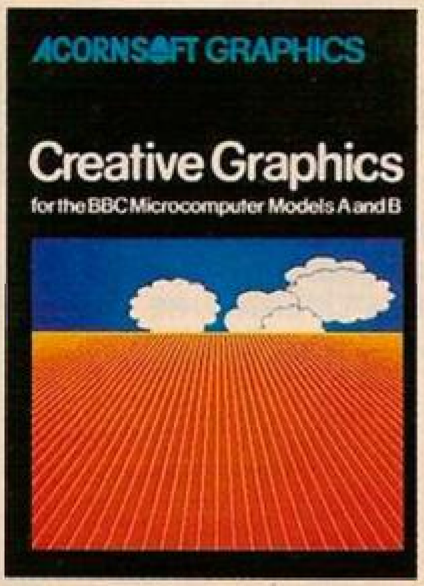
The BBC Microcomputer system is generally regarded to be the best micro in its price range you can lay your hands on. So, if you're thinking of buying one or already own one, you'll want to know about the software that's been specially designed for it.

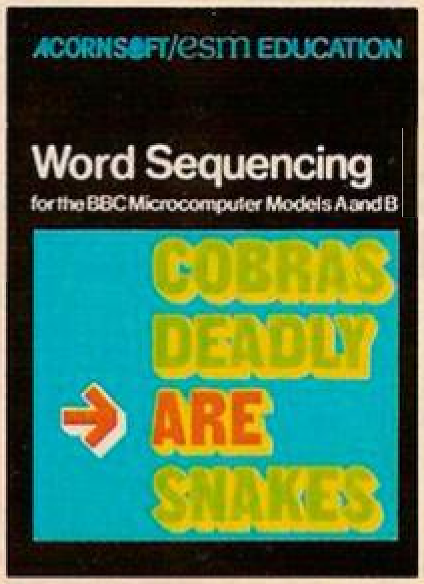
Not surprisingly, it's made by Acornsoft, the software division of Acorn Computers Ltd., who designed and built the BBC Microcomputer. So naturally you can expect the highest quality software with the built-in ingenuity to fully exploit the BBC Micro's potential.

<u>Further education for everyone.</u>

Creative Graphics, which includes the book 'Creative Graphics on the BBC Microcomputer' (price £17.45), provides 36 programs on cassette producing a spectacular range of pictures and patterns in full colour, including animated pictures, recursively-defined curves and three dimensional shapes.

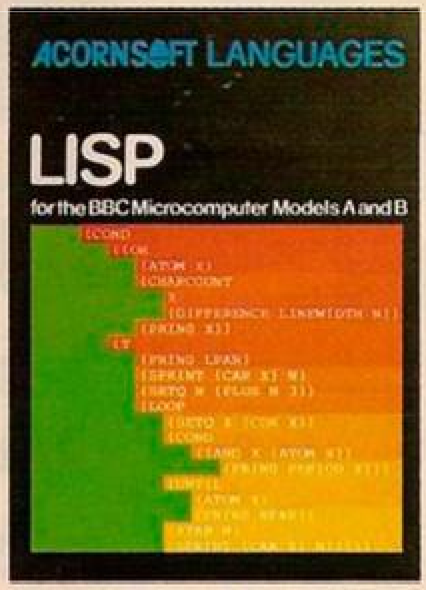
Word Sequencing (price £11.90) contains three word sequencing programs on cassette. Each program presents a series of jumbled words which must be arranged on screen to form either a proverb, nursery rhyme title or a sensible sentence.

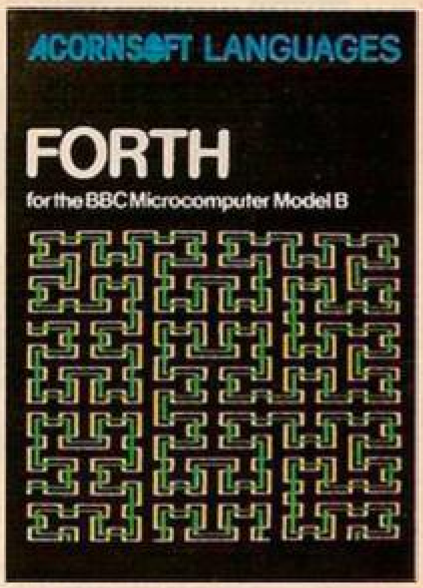




<u>Learn more languages.</u>

LISP (price £24.35) is the fundamental language of artificial intelligence research.





It consists of 5.5K of machine code interpreter, plus 3K of initialised LISP work-space containing utilities and constants. It comes complete with a book that introduces you to programming in LISP, as well as some fascinating applications.

FORTH (price £24.35) is a complete implementation of the FORTH language to the 1979 standard specification for the BBC Microcomputer Model B. This much acclaimed programming language is also accompanied by a specially written book explaining all you need to know.



<u>Mind-boggling games.</u>

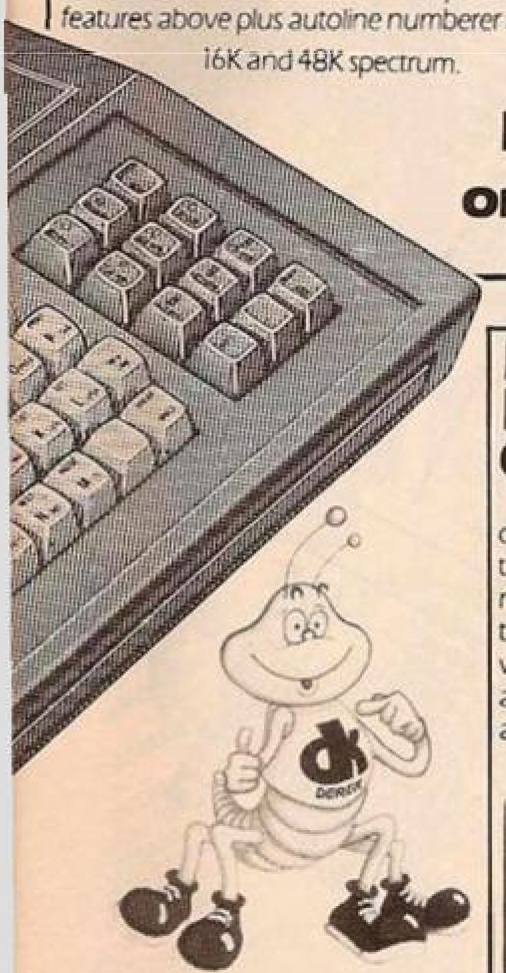
Philosopher's Quest (price £9.95) is an advanced adventure in which you tell the computer what you want to do and it

ZX 80~81 Spectrum HARDWARE

SPECTRUM/81 TOOLKIT

This is the toolkit which won acclaim in the feature in the August 1982 issue (pages 29 and 30) of Sinclair User. "It is the most impressive program, fast in execution with clear and full instructions...it stands out from the rest of the field." The ZXED is a powerful editor for use on the expanded ZX81. It is intended for use by the serious BASIC programmer and offers several useful and time saving features most helpful during all stages of program development. The facilities provided are as follows: ALTER, BYTES, COPY, DELETE, FIND, HELP, INSERT, KEEP, MOVE, RENUMBER AND VERIFY. The Spectrum Toolkit contains most of the features above plus autoline numberer and append, and will run in the 16K and 48K spectrum.

Both at only £6.95



4K GRAPHICS ROM £24.95

The DK Graphic module is our latest ZX 81 accessory. This module unlike most other accessories fits neatly inside your computer under the keyboard. The module comes ready built, fully tested and complete with a 4K graphic ROM. This will give you an unbelievable 448 extra pre-programmed graphics, your normal graphic set contains only 64. This means that you now have 512 graphics and with their inverse 1024. This now turns the 81 into a very powerful computer with a graphic set rarely found on larger more expensive machines. In the ROM are lower case letters, bombs, bullets, rockets, tanks, a complete set of invaders graphics and that only accounts for about 50 of them, there are still about 400 left (that may give you an idea as to the scope of the new ROM). However, the module does not finish there, it also has a spare holder on the board which will accept a further 4K of ROM/RAM. This holder can be fitted with a 1K/2K/RAM and can be used for user definable graphics so you can create your own custom character sets.

WHY WAIT?
ORDER TODAY FOR FAST DELIVERY

FLEXIBLE RIBBON CONNECTOR

If you have ever had whiteouts or system crashes this could be the answer. It stops the movement between the computer and the RAM expansion, it is supplied with a ribbon, 6 inches long, with a male connector at one end and a female at the other, at only

£10



16/64 MEMORY FOR ZX 81



16K Memory £22.95
16K (uncased) £19.95
64K Memory £52.95
64K (uncased) £49.95

The above illustration shows the casing for the 16K or massive 64K.

UM MEMORY

ansion £22.95
)ynamic Ram Chips. We use the dynamic as they are much denser than
py less space. They are also much cheaper than the equivalent product
. The Ram is manufactured with high quality materials, and uses high
ms. It is supplied ready-built and only needs to be plugged into the rear of
he components are fitted into holders. This massive add-on memory
fully assembled and tested is the cheapest 16K memory available any-
nemory from 16384 to 32768. (Same as the Sinclair memory.)
16K (UNCASED) £19.95

ansion £52.95
nation on the 16K also applies to the 64K Memory Expansion, but the
64K giving nearly FOUR times the memory. This advanced model has
ry. In addition, the block from 8K to 16K can be switched out to enable
l-ons. The graphics ROM is to be used in this area. Position in Memory:
ck From 8192-16384 is switchable.
64K (UNCASED) £49.95

Expansion £35.00
um to 48K of user Ram. The Spectrum memory expansion is simple to fit,
side the case, and then only requires plugging in. Full fitting instructions
e only tool you will need is a screwdriver and just two minutes of your
ires no electronic skills. Position in memory from 32768 to 65536. (The
grade to 48K).

Please state type of machine, which Rom memory size, quantity and place when ordering.

Please send me . . . . @ £ . . . .

Please send me . . . . @ £ . . . .

Please send me . . . . @ £ . . . .

Please add on £1.25 for P/P
In enclose cheque/P.O. payable to DK Tronics total £ . . . .
or debit my Access/Barclaycard

Signature . . . .
Name . . . .
Address . . . .

Send to DK tronics, Unit 2, Shire Hill Ind Est, Saffron Walden, Essex CB11 3AQ. Tel: (0799) 22359/26350 (24 hrs)

dk'tronics

New colour brochure now available, send SAE for quick return

WORLD'S LARGEST LIST OF





HARDWARE (All prices include VAT)

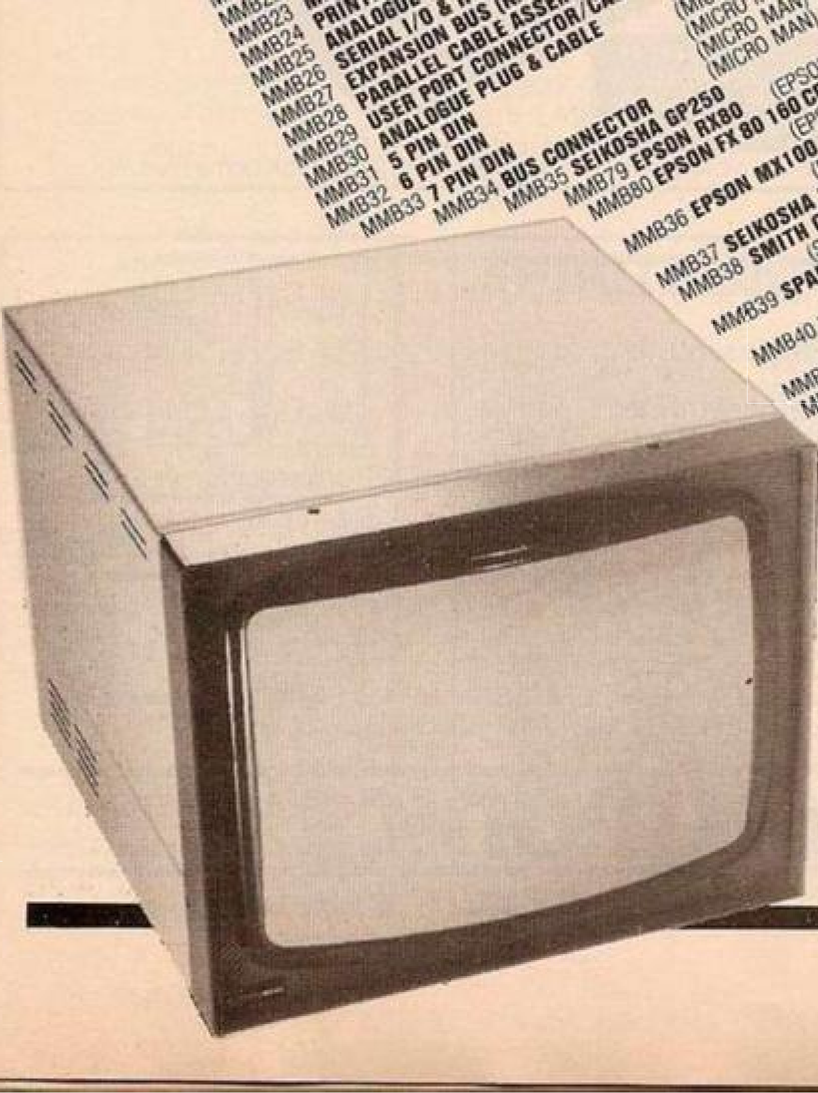
Code	Item	Supplier	Price
MMB01	BBC MODEL B	(ACORN)	£ 399.00
MMB02	BBC MODEL B + ECONET	(ACORN)	£ 446.00
MMB03	BBC MODEL B + ECON/DISK INT	(ACORN)	£ 516.00
MMB04	BBC MODEL B + DISK INTERFACE	(ACORN)	£ 469.00
MMB05	BBC MODEL A	(ACORN)	£ 299.00
MMB06	BBC MODEL A + ECONET	(ACORN)	£ 346.00
MMB07	BBC DISK DRIVE 100K	(ACORN)	£ 265.00
MMB08	BBC DISK DRIVE 800K	(ACORN)	£ 803.85
MMB09	BBC DISK INTERFACE	(ACORN)	£ 109.25
MMB10	BBC 6502 2nd PROCESSOR	(ACORN)	£ 195.50
MMB11	BBC Z80 2nd PROCESSOR	(ACORN)	£ 310.50
MMB12	TELETEXT RECEIVER	(ACORN)	£ 225.00
MMB13	PRESTEL RECEIVER	(ACORN)	£ 103.50
MMB14	JOYSTICKS (PAIR)	(ACORN)	£ 13.00
MMB15	RGB COLOUR MONITOR S/RES	(MICROVITEC)	£ 287.50
MMB16	RGB COLOUR MONITOR H/RES	(MICROVITEC)	£ 632.50
MMB17	RGB CABLE	(MICRO MAN)	£ 5.75
MMB18	12" GREEN MONITOR	(PRINCE)	£ 99.00
MMB19	12" AMBER MONITOR	(PRINCE)	£ 115.75
MMB20	PLINTH FOR RGB MONITOR	(MICROVITEC)	£ 8.96
MMB21	A TO B UPGRADE (FITTED)	(ACORN)	£ 115.00
MMB22	A TO B UPGRADE (KIT)	(ACORN)	£ 59.80
MMB23	MEMORY UPGRADE (KIT)	(ACORN)	£ 24.72
MMB24	PRINTER I/O (KIT)	(ACORN)	£ 8.74
MMB25	ANALOGUE (KIT)	(ACORN)	£ 8.74
MMB26	SERIAL I/O & RGB (KIT)	(ACORN)	£ 11.79
MMB27	EXPANSION BUS (KIT)	(ACORN)	£ 6.84
MMB28	PARALLEL CABLE ASSEMBLED	(MICRO MAN)	£ 15.00
MMB29	USER PORT CONNECTOR/CABLE	(MICRO MAN)	£ 2.30
MMB30	ANALOGUE PLUG & CABLE	(MICRO MAN)	£ 2.58
MMB31	5 PIN DIN	(MICRO MAN)	£ 0.69
MMB32	6 PIN DIN	(MICRO MAN)	£ 0.69
MMB33	7 PIN DIN	(MICRO MAN)	£ 0.69
MMB34	BUS CONNECTOR	(MICRO MAN)	£ 4.03
MMB35	SEIKOSHA GP250		£ 276.00
MMB79	EPSON RX80	(EPSON)	£ 339.25
MMB80	EPSON FX 80 160 CPS	(EPSON)	£ 454.25
MMB36	EPSON MX100	(EPSON)	£ 488.75
MMB37	SEIKOSHA GP100		£ 215.00
MMB38	SMITH CORONA D/WHEEL	(SMITH COR)	£ 511.75
MMB39	SPARK JET PRINTER	(ACORN)	£ 419.75
MMB40	TEC STARWRITER	(TEC)	£1265.00
MMB41	5¼" DISKS (10)		£22.43
MMB42	COMPUTER CASSETTE TAPES		£ 1.00
MMB43	COMPUTER DUST COVER	(MICRO MAN)	£ 5.74
MMB44	DISK DRIVE DUST COVER	(MICRO MAN)	£ 5.74
MMB45	CASSETTE RECORDER		£ 29.00
MMB46	FLOWCHART STENCIL		£ 4.02
MMB47	DISK LIBRARY CASE	(ACCO)	£ 2.87
MMB48	PAPER LISTING BINDER		£ 2.87
MMB49	PAPER 9½"11" (2000)		£ 14.95
MMB50	GRAPHICS TABLET (CASS'E)	(MICRO MAN)	£ 86.25
MMB51	GRAPHICS TABLET (DISK)	(MICRO MAN)	£ 143.75
MMB52	LIGHT PEN	(MICRO MAN)	£ 34.50
MMB53	A/D CONVERTOR	(MICRO MAN)	£ 36.23
MMB54	128 K RAM PACK	(MICRO MAN)	£ 343.85
MMB55	COOLING FAN		£ 38.24
MMB56	DISK DRIVE S.S.40 TRACK	(TEAC)	£ 228.85
MMB57	DISK DRIVE D.S.80 TRACK	(TEAC)	£ 396.75
MMB58	DISK DRIVE 2*D.S.80 TRACK	(TEAC)	£ 711.85
MMB59	2 DRIVE CABLE FOR ABOVE		£ 17.25
MMB60	APL FOR BBC COMP (BOOK)		£ 8.95
MMB61	30 PROGS FOR BBC (BOOK)		£ 4.95
MMB62	PROG THE 6502 (BOOK)	(R. ZAKS)	£ 10.75
MMB63	6502 APPLICATIONS (BOOK)	(R. ZAKS)	£ 10.75
MMB64	BBC MICRO REVEALED (BOOK)	(J.RUSTON)	£ 7.95
MMB65	LET BBC TEACH (BOOK)	(T.HARTNELL)	£ 6.45
MMB66	30 HOUR BASIC (BOOK)	(C.PRIGMORE)	£ 5.95
MMB67	Z80 DISK PACK	(TORCH)	£ 780.00
MMB68	6502 SOFTWARE DESIGN	(L.J.SCANLON)	£ 10.25
MMB69	INTRODUCTION TO FORTH	(K.NECHT)	£ 8.25
MMB70	DISCOVER FORTH	(T.HOGAN)	£ 10.25
MMB71	PRACTICAL PROGS FOR 6502	(W.J.WELLER)	£ 14.95
MMB72	PRACT PROGS FOR BBC & ATOM	(D.JOHNSTON-DAVIS)	£ 5.95
MMB73	THE COMPUTER BOOK	(BBC)	£ 6.75
MMB74	EASY PROG FOR BBC	(E.DEESON)	£ 5.95
MMB75	GAMES FOR BBC COMPS PLAY	(T.HARTNELL)	£ 5.95
MMB76	BASIC P'GRAMMING FOR BBC	(N.&P.CRYER)	£ 5.95
MMB77	FORTH PROGRAMMING	(SAMS)	£ 12.50
MMB78	1.2 OPERATING ROM	(ACORN)	£ 11.50

SOFTWARE (All prices include VAT)

Code	Item	Supplier	Price
MMS001	OPTIONS TIMETABLE (C)	(A.J. VISION)	£18.40
MMS002	RECORD CHANGER	(A.J. VISION)	£23.00
MMS003	WORD PROCESSOR	(A.J. VISION)	£18.40
MMS004	EDUCATIONAL—1	(GOLEM)	£ 9.25
MMS005	COLOSSAL ADVENTURE	(LEVEL 9)	£11.38
MMS006	ADVENTURE QUEST	(LEVEL 9)	£11.38
MMS007	DUNGEON ADVENTURE	(LEVEL 9)	£11.38
MMS008	STARSPELL	(FISHER MARRIOTT)	£11.50
MMS009	TABLE STAR	(FISHER MARRIOTT)	£11.50
MMS010	EARLY WARNING	(A & F SOFTWARE)	£ 6.90
MMS011	ROADRUNNER	(A & F SOFTWARE)	£ 6.90
MMS012	PLANES	(A & F SOFTWARE)	£ 7.99
MMS013	PHARAOHS TOMB	(A & F SOFTWARE)	£7.99
MMS014	FROGGER	(A & F SOFTWARE)	£7.99
MMS015	LUNAR LANDER	(A & F SOFTWARE)	£ 6.90
MMS016	TOWER OF ALTOS	(A & F SOFTWARE)	£ 6.90
MMS017	MAZE INVADERS	(PROGRAM POWER)	£ 5.69
MMS018	FOOTER	(PROGRAM POWER)	£ 7.99
MMS019	GOMOKO	(PROGRAM POWER)	£ 4.54
MMS020	MUNCYMAN	(PROGRAM POWER)	£ 6.84
MMS021	MASTERMIND	(PROGRAM POWER)	£ 4.54
MMS022	SPACE MAZE	(PROGRAM POWER)	£ 6.84
MMS023	COWBOY SHOOTOUT	(PROGRAM POWER)	£ 6.84
MMS024	ALIEN DESTROYER	(PROGRAM POWER)	£ 7.99
MMS025	MARTIANS	(PROGRAM POWER)	£ 6.84
MMS026	SWOOP	(PROGRAM POWER)	£ 7.99
MMS027	SEEK	(PROGRAM POWER)	£ 6.84
MMS028	GALACTIC COMMANDER	(PROGRAM POWER)	£ 7.99
MMS029	CAT & MOUSE	(PROGRAM POWER)	£ 5.69
MMS030	ZOMBIES	(PROGRAM POWER)	£ 4.54
MMS031	STARTREK	(PROGRAM POWER)	£ 5.69
MMS032	REVERSI 1	(PROGRAM POWER)	£ 5.69
MMS033	CHESS	(PROGRAM POWER)	£ 7.99
MMS034	WORLD GEOGRAPHY	(PROGRAM POWER)	£ 6.84







MICRO MANAGEMENT ORDER FORM

CODE	ITEM	QTY	AT £	AT p	COST £	COST p
CREDIT CARD No		SUB TOTAL				
NAME	BARCLAY/ACCESS	POST & PACKING				
ADDRESS		TOTAL				

BBC MICROS ACCESSORIES

Market your own software through us
Write with details

MMS060 ALGEBRAIC MANIPULATION (ACORNSOFT) £ 9.95
MMS061 MONSTERS (ACORNSOFT) £ 9.95
MMS062 PLANETOID (ACORNSOFT) £ 9.95
MMS063 ARCADE ACTION (ACORNSOFT) £11.90
MMS064 DESK DIARY (ACORNSOFT) £ 9.95
MMS065 PHILOSOPHERS QUEST (ACORNSOFT) £ 9.95
MMS066 LISP (ACORNSOFT) £16.85
MMS067 GRAPHS & CHARTS (ACORNSOFT) £ 9.95
MMS068 CREATIVE GRAPHICS (BOOK) (ACORNSOFT) £ 7.50

MMS069 LOGO II (COMPUTER CONCEPTS) £11.50
MMS070 FRUIT MACHINE (BUG-BYTE) £ 5.50
MMS071 FORTH (LEVEL 9) £17.25
MMS073 HITCH-HIKER (COMPUTER CONCEPTS) £ 6.67
MMS074 SPACEHAWKS (COMPUTER CONCEPTS) £ 8.97
MMS075 ASTEROID BELT (COMPUTER CONCEPTS) £ 8.97
MMS076 CHESS (COMPUTER CONCEPTS) £11.50
MMS077 ANGLEZUP (GEM SOFTWARE) £ 6.88
MMS078 L TRAP (GEM SOFTWARE) £ 6.88
MMS079 TAKE OFF (GEM SOFTWARE) £ 5.73
MMS080 GRAPH CAPERS (GEM SOFTWARE) £ 6.88
MMS081 MONTE CARLO (GEM SOFTWARE) £ 6.88
MMS082 SPACE WARP (BUG-BYTE) £ 9.00
MMS083 GOLF (BUG-BYTE) £ 5.50
MMS084 DRAGON QUEST (BUG-BYTE) £11.50
MMS085 AIRLIFT (BUG-BYTE) £ 5.50
MMS086 POLARIS (BUG-BYTE) £ 5.50
MMS089 CUBE MASTER (ACORNSOFT) £ 9.95
MMS090 GRAPHS & CHARTS (BOOK) (ACORNSOFT) £ 7.50
MMS091 HOME FINANCE (BBC) £10.00
MMS092 EARLY LEARNING (BBC) £10.00
MMS093 MUSIC (BBC) £10.00
MMS094 THE COMPUTER PROG VOL 1 (BBC) £10.00
MMS095 THE COMPUTER PROG VOL 2 (BBC) £10.00
MMS096 PAINTING (BBC) £10.00
MMS097 DRAWING (BBC) £10.00
MMS098 GAMES OF STRATEGY (BBC) £10.00
MMS099 FUN GAMES (BBC) £10.00
MMS100 THE COMPUTER BOOK (BBC) £ 6.75
MMS101 SALES LEDGER DISK (MICRO MAN) £57.44
MMS102 PURCHASE LEDGER DISK (MICRO MAN) £57.44
MMS103 FILE IT DISK (MICRO MAN) £22.94
MMS104 MAILING LIST DISK (MICRO MAN) £11.44
MMD105 WORD SEQUENCING (ACORNSOFT) £15.35
MMD106 MISSING SIGNS (ACORNSOFT) £15.35
MMD107 SENTENCE SEQUENCING (ACORNSOFT) £15.35
MMD108 ROCKET RAID (ACORNSOFT) £11.50
MMD109 MONSTERS (ACORNSOFT) £11.50
MMD110 SNAPPER (ACORNSOFT) £11.50
MMD111 METEORS (ACORNSOFT) £11.50
MMD112 PLANETOID (ACORNSOFT) £11.50
MMS113 INVADERS (I.J.K.) £ 7.50
MMS114 MUTANT BREAKOUT (I.J.K.) £ 6.50
MMS115 3-D MAZE (I.J.K.) £ 4.50
MMS116 BEEB BEEP (I.J.K.) £ 4.50
MMS117 HYPERDRIVE (I.J.K.) £ 6.50
MMS118 SUPER HANGMAN (I.J.K.) £ 4.50
MMS119 FLAGS (I.J.K.) £ 4.50
MMS120 STRATOBOMBER (I.J.K.) £ 7.50
MMS121 FAMILY GAMES (I.J.K.) £ 4.50
MMS122 ATLANTIS (I.J.K.) £ 7.50
MMS123 BEEBMUNCH (I.J.K.) £ 6.50
MMS124 STARTREK/CANDYFLOSS (I.J.K.) £ 6.50
MMS125 WORDPRO (I.J.K.) £10.50
MMS126 POLAR BEAR (SOFTWARE FOR ALL) £ 7.45
MMS127 DATABASE FOR 16/32K (SOFTWARE FOR ALL) £ 8.95
MMS128 J.R. (SOFTWARE FOR ALL) £ 6.95

MMS129 SPACE KINGDOM (SOFTWARE FOR ALL) £ 7.95
MMS130 CAR WARS/ALIEN PLANET (SOFTWARE FOR ALL) £ 6.95
MMS131 TIME TRAVELLER (SOFTWARE FOR ALL) £ 6.95
MMS132 UTILITY PACK I (SOFTWARE FOR ALL) £ 7.45
MMS133 ZOMBIE ISLAND (SOFTWARE FOR ALL) £ 7.94
MMS134 ROW OF FOUR (SOFTWARE FOR ALL) £ 6.54
MMS135 BEEBTREK (SOFTWARE FOR ALL) £ 7.95
MMS136 GALACTIC INTRUDER (SOFTWARE FOR ALL) £ 6.95
MMS137 INHERITANCE (SIMON W. HESSEL) £ 5.95
MMS138 GREAT BRITAIN LTD. (SIMON W. HESSEL) £ 5.95
MMS139 WORLD TRAVEL GAME (SIMON W. HESSEL) £ 6.95
MMS140 PASCAL (CHALKSOFT) £ 5.95
MMS141 ANGLE (CHALKSOFT) £ 8.95
MMS142 INKOSI (CHALKSOFT) £ 5.95
MMS143 INVISIBLE MAN (CHALKSOFT) £ 5.95
MMS144 LETTERS (CHALKSOFT) £ 9.95
MMS145 METRICS (CHALKSOFT) £ 9.95
MMS146 SEQUENCES (ACORNSOFT) £ 5.95
MMS147 CASTLE OF RIDDLES (J.RUSTON) £ 9.95
MMS148 BBC BASIC COMPILER (ACORNSOFT) £39.68
MMS149 FORTH (ACORNSOFT) £16.85
MMS150 ROCKET RAIDER (ACORNSOFT) £ 9.95
MMS151 SPHINX ADVENTURER (ACORNSOFT) £ 9.95
MMS152 SLIDING BLOCK PUZZLER (SOFTEFEX) £ 9.95
MMS153 MUSIC TUTOR I (CARLTON COMPUTING) £ 7.19
MMS154 MORSE TUTOR (C.J.E.) £ 5.75
MMS155 30 + PROGS FOR THE BBC £ 4.60





MMS035 JUNIOR MATHS (PROGRAM POWER) £ 6.84
MMS036 DISASSEMBLER (PROGRAM POWER) £ 6.84
MMS037 TIMETREK (PROGRAM POWER) £ 7.99
MMS038 ADVENTURE (PROGRAM POWER) £ 7.99
MMS039 ELDORADO GOLD (PROGRAM POWER) £ 6.84
MMS040 LASER COMMAND (PROGRAM POWER) £ 7.99
MMS041 ASTRO NAVIGATOR (PROGRAM POWER) £ 5.69
MMS042 MICRO BUDGET (PROGRAM POWER) £ 7.90
MMS043 FILER (PROGRAM POWER) £10.29
MMS044 CONSTELLATION (PROGRAM POWER) £ 6.84
MMS045 BEEBTAPE (CSL MICRODATA) £ 4.60
MMS046 MICRODERBY (BUG-BYTE) £ 5.50
MMS047 SPACE PIRATES (BUG-BYTE) £ 8.00
MMS048 CHESS (BUG-BYTE) £ 8.00
MMS053 ARCADIANS (ACORNSOFT) £ 9.95
MMS054 SNAPPER (ACORNSOFT) £ 9.95
MMS055 METEORS (ACORNSOFT) £ 9.95
MMS056 CREATIVE GRAPHICS (ACORNSOFT) £ 9.95
MMS057 TREE OF KNOWLEDGE (ACORNSOFT) £ 9.95
MMS058 BUSINESS GAMES (ACORNSOFT) £ 9.95
MMS059 PEEKO-COMPUTER (ACORNSOFT) £ 9.95

Local Authorities and Government Departments. Orders welcomed. Educational Seminars given.

MMS156 WAR & PEACE NUMBERS (FISHER MARRIOTT) £11.50
MMS157 WAR & PEACE TABLES (FISHER MARRIOTT) £11.50
MMS158 WORDWISE (COMPUTER CONCEPTS) £44.85
MMS159 EDUCATIONAL 2 (GOLEM) £ 9.25
MMS160 SUPERLIFE (GOLEM) £10.58
MMS161 KATAKOMBS (GOLEM) £10.58
MMS162 UTILITIES (GOLEM) £ 9.25

Overseas dealers and distributors enquiries welcomed. Exports a speciality

Mail or telephone order
Barclaycard or Access
Credit Card accepted

Access | BARCLAYCARD VISA

Only defective or faulty goods may be returned.

MICRO MANAGEMENT

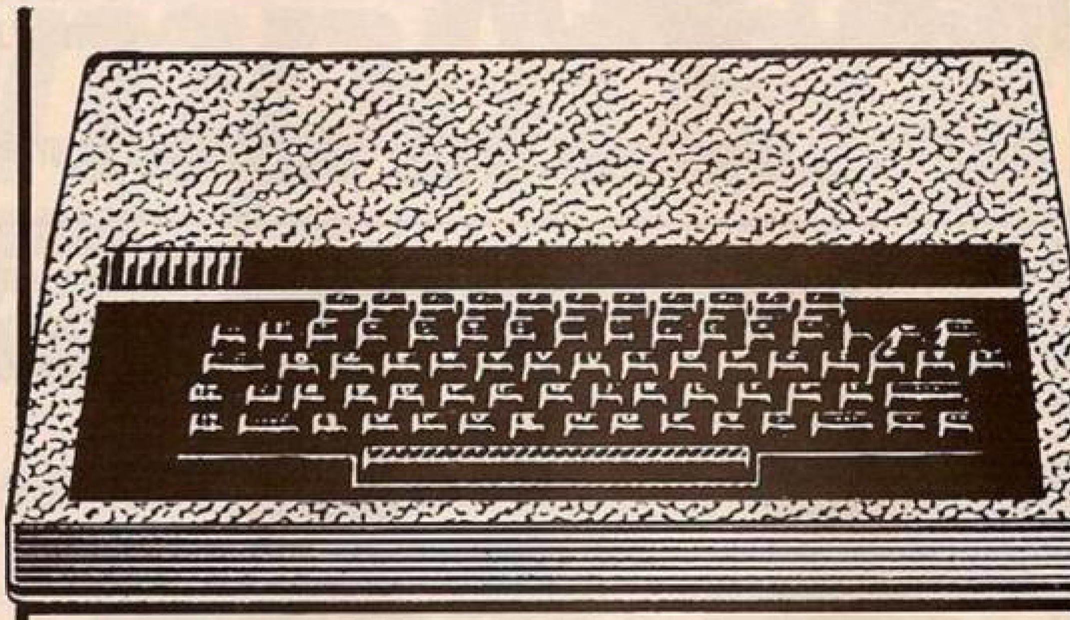
POST and PACKING IS STILL ONLY £1 PER ITEM

Micro Management 32 Princes Street, Ipswich, Suffolk. Telephone: (0473) 59181

Midwich

COMPUTER COMPANY LIMITED

1st choice for BBC microcomputers



BBC COMPUTERS

Model B		£346.95
Model B + Disc Interface		£441.95

BBC MICRO DISC DRIVES

BBC 31	Single 100K Drive Expandable to 2 x 100K	£199.00
BBC 32	Dual 100K Drives	£330.00
BBC 33	100K Upgrade for BBC 31	£122.00
BBC 34	Dual 400K Drives	£649.00

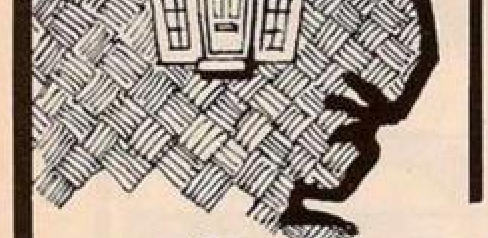
BBC 35 Acorn Utilities Disc/Manual £30.00 (supplied only with BBC 31, 32, 34)
All Drives except BBC 33 supplied cased with Connecting Leads.

BBC UPGRADE KITS

BBCA2B	Complete A to B Upgrade	£44.75
BBC 1	16K Memory	£18.00
BBC 2	Printer/User 1/0 Kit	£ 7.50
BBC 3	Disc Interface Kit	£95.00
BBC 4	Analogue Input Kit	£ 6.70
BBC 5	Serial 1/0 RGB Kit	£ 7.30
BBC 6	Bus. Expansion Kit	£ 6.45

All kits are supplied with full fitting instructions.

Fast ex-stock delivery by Securicor...



Fitting Service available

12 month "no quibble" warranty on all products

BBC CONNECTORS

BBC 21	Printer Cable and Amphenol Plug (not assembled)	£13.00
BBC 22	User Port Connector and Cable 36"	£ 2.46
BBC 23	Cassette Lead	£ 3.50
BBC 24	7 Pin Din Plug	£ 0.60
BBC 25	6 Pin Din Plug	£ 0.60
BBC 26	5 Pin Din Plug	£ 0.60
BBC 35	Disc 1/0 Cable 34W IDC to 2 x 34 way Card Edge	£12.00
BBC 36	Disc Power Cable	£ 6.00
BBC 44	Analogue Input Plug & Lever	£ 2.25
BBC 66	1 M Bus Connector + 36" Cable	£ 3.50

BBC ACCESSORIES

BBC 45	Joysticks (per pair)	£11.30
BBC 67	Eprom Programmer (assembled)	£57.95

ACORNSOFT FOR THE BBC

SBE03	Business Games	£ 8.65
SBE04	Tree of Knowledge	£ 8.65
SBE02	Peeko Computer Inc Manual	£ 8.65
SBE01	Algebrail Manipulation PK	£ 8.65
SBX01	Creative Graphics Cassette	£ 8.65
SBX02	Graphs & Charts Cassette	£ 8.65
SBB01	Desk Diary Inc Manual	£ 8.65
SBL02	Lisp Cassette	£14.65
SBL01	Forth Cassette	£14.65
SBG01	Philosophers Quest	£ 8.65
SBG07	Sphinx Adventure	£ 8.65
SBG03	Monsters	£ 8.65
SBG04	Snapper	£ 8.65
SBG15	Planetoid	£ 8.65
SBG06	Arcade Action	£10.35
SBG05	Rocket Raid	£ 8.65
SBG13	Meteors	£ 8.65
SBG14	Arcadians	£ 8.65
SBG10	Chess	£ 8.65

ACORNSOFT BOOKS FOR THE BBC MICRO

SBD01	Creative Graphics	£ 7.50
SBD02	Graphs - Charts	£ 7.50
SBD04	Lisp	£ 7.50
SBD03	Forth	£ 7.50

* Please ring for current delivery on Acornsoft products before ordering.

BBC MICRO COMPONENTS

4516 100NS	£ 2.25
6522	£ 3.19
74LS244	£ 0.59
74LS245	£ 0.69
74LS163	£ 0.34
DS3691N	£ 4.50
DS88LS120N	£ 4.50
UPD7002	£ 4.50
8271	£36.00
20 Way Header	£ 1.46
26 Way Header	£ 1.76
34 Way Header	£ 2.06
40 Way Header	£ 2.32
15 Way D Skt	£ 2.15
6 Way Din Skt	£ 0.90
5 Way Din Skt	£ 0.90

BBC SOFTWARE IN ROM.

Wordprocessor "View"	£52.00
1.2 MOS	£10.00

...from East Anglias leading supplier

Delivery Charges
Computers/Disc Drives £5.00
Components/Software £0.50
Books/Joysticks £1.00

MIDWICH COMPUTER COMPANY LIMITED

RICKINGHALL HOUSE. RICKINGHALL. SUFFOLK IP22 1HH
TELEPHONE (0379) DISS 898751

BBC, DRAGON & ATARI GAMES FROM QUICKSILVA

DRAGON
MINED-OUT

On Screen Features: Tricky Mines, Damsels in distress, Mine detection indicator, 9 levels of minefield, Safe area, Progressive difficulty, Scoring, High score feature, Full instructions.
Controls: Up-Down-Left-Right.
Special Features: Bill the Worm, Bugs (mines with legs). Mine Spreaders. Action Replay.
Author: **Ian Andrew**

ATARI 400/800
MAGIC WINDOW

Define characters on 8x8 grid. Save to tape. Load from tape. Freely merges character sets into existing programs. Hex & Dec. O/Ps. Character manipulation: Mirror, rotate, invert, left, right, up, down, hold, wipe, cancel. Redefine whole character set. Also works in colour mode. Excellent examples supplied.
16K RAM or more.
Author: **M. Walker**



As part of the plan to expand their range to cover all the most popular personal computers QUICKSILVA are proud to introduce 3 new programs for the BBC Computer, plus a version of their popular "MINED-OUT" game for the Dragon and also a character generating program for the Atari 400/800 "MAGIC WINDOW".

BBC GAMES
MUSIC PROCESSOR

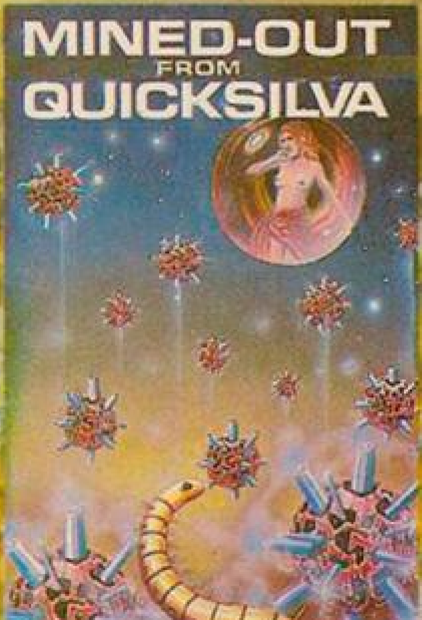
Exploits your BBC music potential to its limits.
Features: Full push button operation, over 30 separate functions for recording, mixing, editing and sound effects etc. 4 channels, 5 octaves, 100,000 envelopes easily selected. Over 2000 note storage capacity. Ready made music files included.
Author: **Andy Williams**
For model A or B

PROTECTOR

Features: Pods, monsters who kill on contact, mine laying UFO's, monsters increase in size as game progresses, new pods every 1000 pts., hyperspace function. Full colour hi-res graphics, sound. Joystick control.
For the model B with 16K + Joystick.
Author: **Andy Green**

WIZARD

The lands most beautiful maidens are being sacrificed by an evil King. Can you be their saviour, fighting off hordes of evil demons armed only with your wand and magical powers. A most compulsive and original game with hi-res colour graphics and full sound.
Author: **A. R. Buckley**
For the model B with 32K



Quicksilva Limited,
Palmerston Park House,
13, Palmerston Road,
Southampton, SO1 1LL
Telephone: (0703) 20169

Please send order to
Quicksilva Limited,
Palmerston Park House,
13, Palmerston Road,
Southampton.

BBC GAMES

Music Processor	£14.95	☐
Protector	£7.95	☐
Wizard	£6.95	☐

DRAGON GAME

Mined-Out	£5.95	☐

ATARI 400/800 GAME

Magic Window	£8.95	☐

WARNING: These programs are sold according to QUICKSILVA Ltd's terms of trade and conditions of sale. Copies of which are available on request.

Access · Barclaycard VISA

Please send me the games as ticked.
Total cheque/P.O. enclosed .... Cheques payable to Quicksilva

Supplied on Cassette

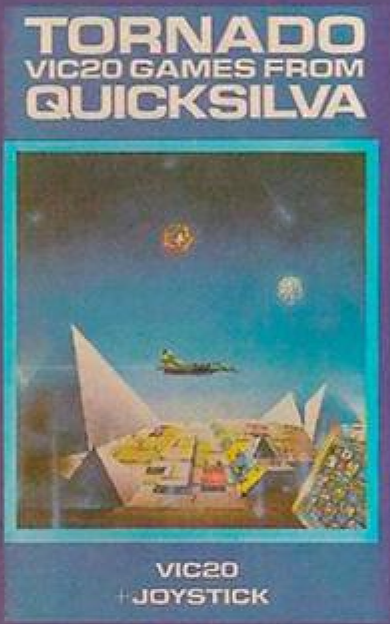
Name ______________________

Address ______________________

____

____

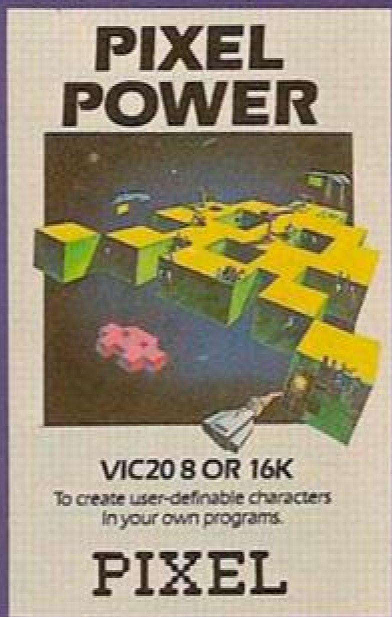
VIC20 GAMES FROM QUICKSILVA



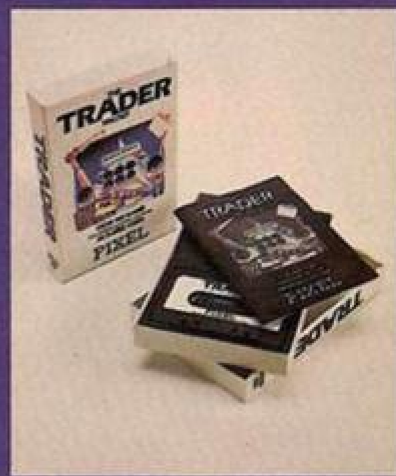
QUICKSILVA are proud to introduce Skyhawk written by Chartec for the VIC20 personal computer, many more amazing games to come!

SKYHAWK: Features Multi-colour, Hi-res 3-D Effect Graphics, Realistic Scrolling Landscape, Aircraft Landing and Refueling, Radar and Aircraft Status Displays, High Score Save, Full Sound Effects, Varying Formations of Attacking Aircraft, Extra Life at 3000 pts, Fuel Low Warning, Realistic Explosions. For the VIC20+3K or 8K expansion+Joystick.









For the VIC20 + 16K RAM.

TORNADO: In the midst of the Colony Wars ships are attacking you from the air, you have three types of ground base to bomb. Features: Full Colour, Hi-Res Graphics, Sound, Increasing Speed, High Score, Progressive Difficulty, Random Landscape, Explosions. By Chartec for the unexpanded VIC20 + Joystick.

PIXEL GAMES

HARVESTER & BRAINSTORM

A cut-throat strategy game to reap valuable boosterspice around the planet Delta. Hi-Res Graphics and lots of fun for two to four players. For the unexpanded VIC20.

STARQUEST/ ENCOUNTER

A voyage of discovery and adventure in the cosmos. With the help of your onboard computer you seek a habitable planet amidst the perils of deep space. For the VIC20 + 16K RAM.

PIXEL POWER

A graphics workshop packed with useful features such as Create, Amend, Save and View Set. For the VIC20 with 8K or more added RAM.

SUBSPACE STRIKER & ZOR

It comes from out of nowhere and then vanishes back into the ether. With your deadly antimat torpedoes, you unleash havoc in the Federation's Spacelanes. For the VIC20+ 16K RAM.

TRADER

A trilogy of 16K programs that combine to give an epic 48K graphic adventure. As a galactic trader, you deal with some very bizarre customers indeed. Will you live to tell the tale? Supplied in a box with extensive instruction booklet.



Tornado	£5.95	☐
Skyhawk	£7.95	☐
Trader	£14.95	☐
Subspace Striker + Zor	£7.95	☐
Starquest + Encounter	£7.95	☐
Pixel Power	£7.95	☐
Harvester + Brainstorm	£7.95	☐

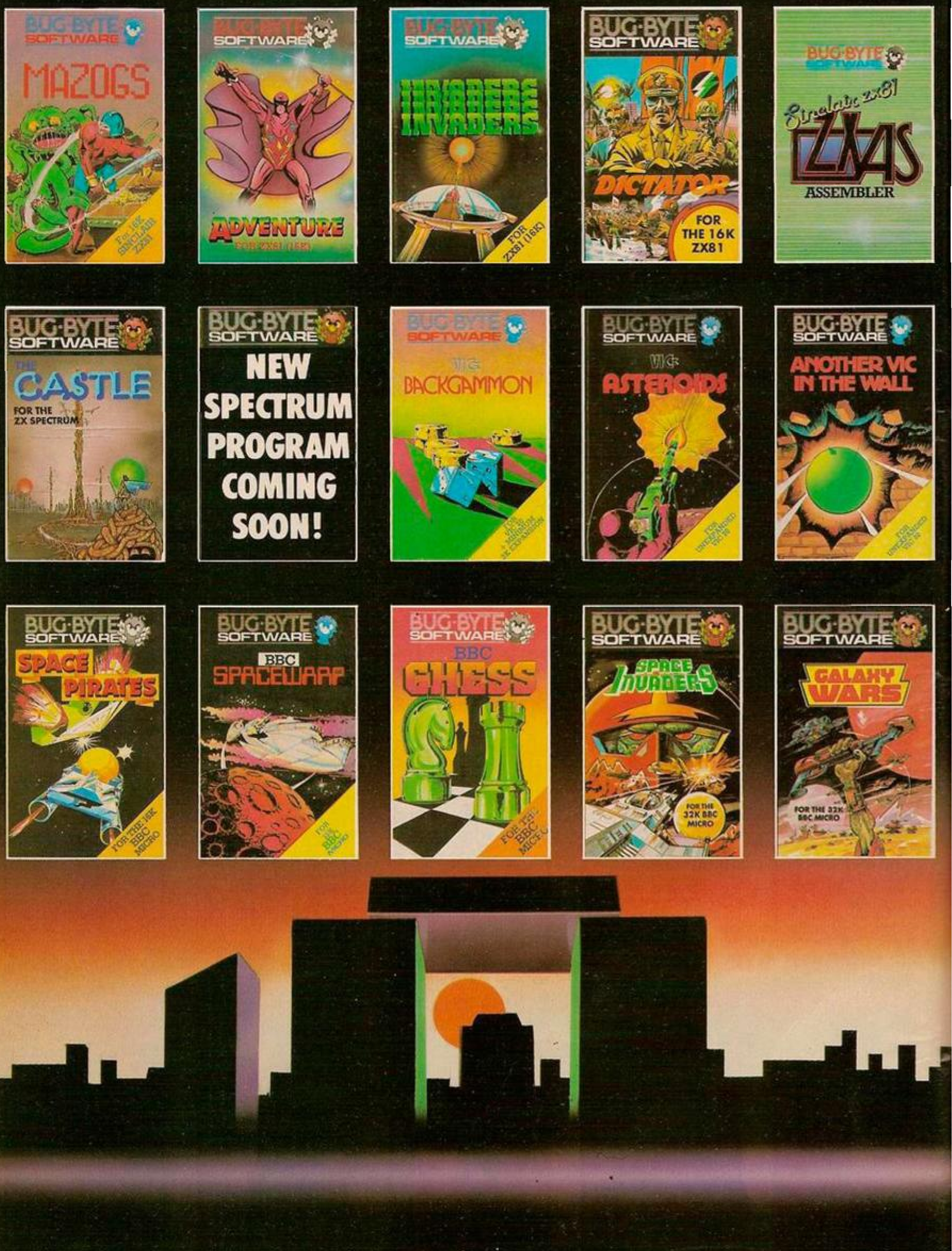
PLEASE SEND ME THE GAMES AS TICKED
Total cheque/P.O. enclosed ________
Cheque payable to Quicksilva Limited.

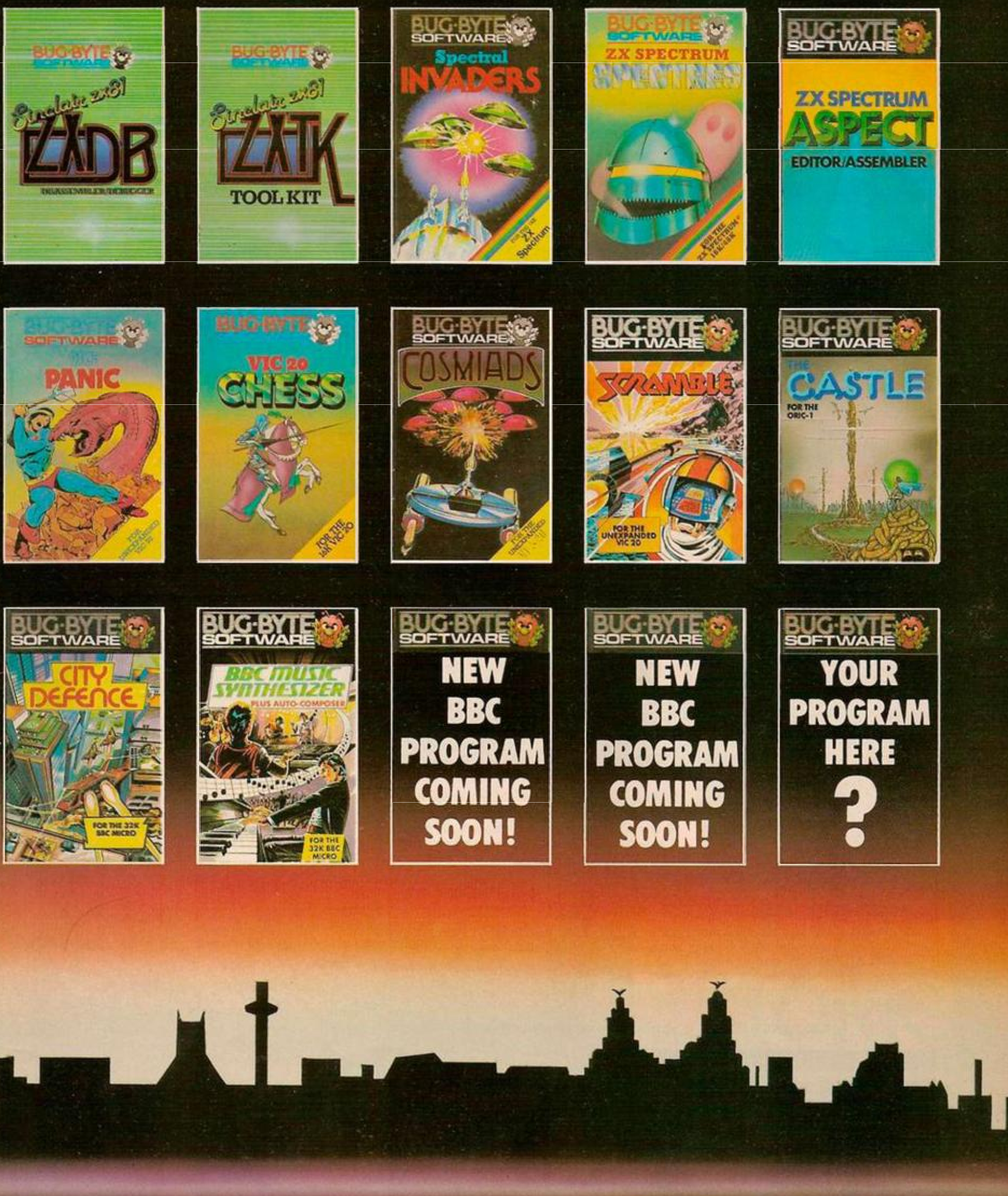
NAME ....

ADDRESS ....

....
SUPPLIED ON CASSETTE

Please send your order to:
QUICKSILVA LIMITED,
PALMERSTON PARK HOUSE,
13 PALMERSTON ROAD,
SOUTHAMPTON.
TEL: (0703) 20169.


BUG-BYTE SOFTWARE
MAZOGS
ADVENTURE
INVADERS
DICTATOR
FOR THE 16K ZX81
ZXAS
ASSEMBLER
THE CASTLE
FOR THE ZX SPECTRUM
NEW SPECTRUM PROGRAM COMING SOON!
BACKGAMMON
ASTEROIDS
ANOTHER VIC IN THE WALL
SPACE PIRATES
BBC SPACEWARP
BBC CHESS
SPACE INVADERS
FOR THE 32K BBC MICRO
GALAXY WARS
FOR THE 32K BBC MICRO


BUG-BYTE SOFTWARE
Sinclair zx81
ZXDB
BUG-BYTE SOFTWARE
Sinclair zx81
ZXTK
TOOL KIT
BUG-BYTE SOFTWARE
Spectral
INVADERS
FOR THE 16K ZX Spectrum
BUG-BYTE SOFTWARE
ZX SPECTRUM
BUG-BYTE SOFTWARE
ZX SPECTRUM
ASPECT
EDITOR/ASSEMBLER
BUG-BYTE SOFTWARE
PANIC
BUG-BYTE
VIC 20
CHESS
FOR THE 16K VIC 20
BUG-BYTE SOFTWARE
COSMIADS
BUG-BYTE SOFTWARE
SCRAMBLE
FOR THE UNEXPANDED VIC 20
BUG-BYTE SOFTWARE
THE CASTLE
FOR THE ORIC-1
BUG-BYTE SOFTWARE
CITY DEFENCE
FOR THE 32K BBC MICRO
BUG-BYTE SOFTWARE
BBC MUSIC SYNTHESIZER
PLUS AUTO-COMPOSER
FOR THE 32K BBC MICRO
BUG-BYTE SOFTWARE
NEW BBC PROGRAM COMING SOON!
BUG-BYTE SOFTWARE
NEW BBC PROGRAM COMING SOON!
BUG-BYTE SOFTWARE
YOUR PROGRAM HERE
?

ORIC Software



For the superb ORIC-1
The finest software, ORIC SOFTWARE

Fast-load action, taking ORIC's colour, graphics and sound capabilities to new frontiers. Carefully designed and selected to match ORIC's quality and quest for timeless technology.

The ever growing range includes programs for Business, Education and In-home entertainment, so whether you want a total business system or 'edge of the chair' arcade excitement, choose ORIC - The new experience in micro-software.

Part of the growing selection includes:-

FOR HOME
BACKGAMMON – CHESS
FLIGHT – ZODIAC – AIRLINE
DALLAS

FOR BUSINESS
ORIC PAY – ORICINV – ORIC STOCK – ORIC CALC – ORIC TYPER – AUTHOR **PLUS** ORIC BASE and ORIC FORTH languages

Real computer software from

ORIC

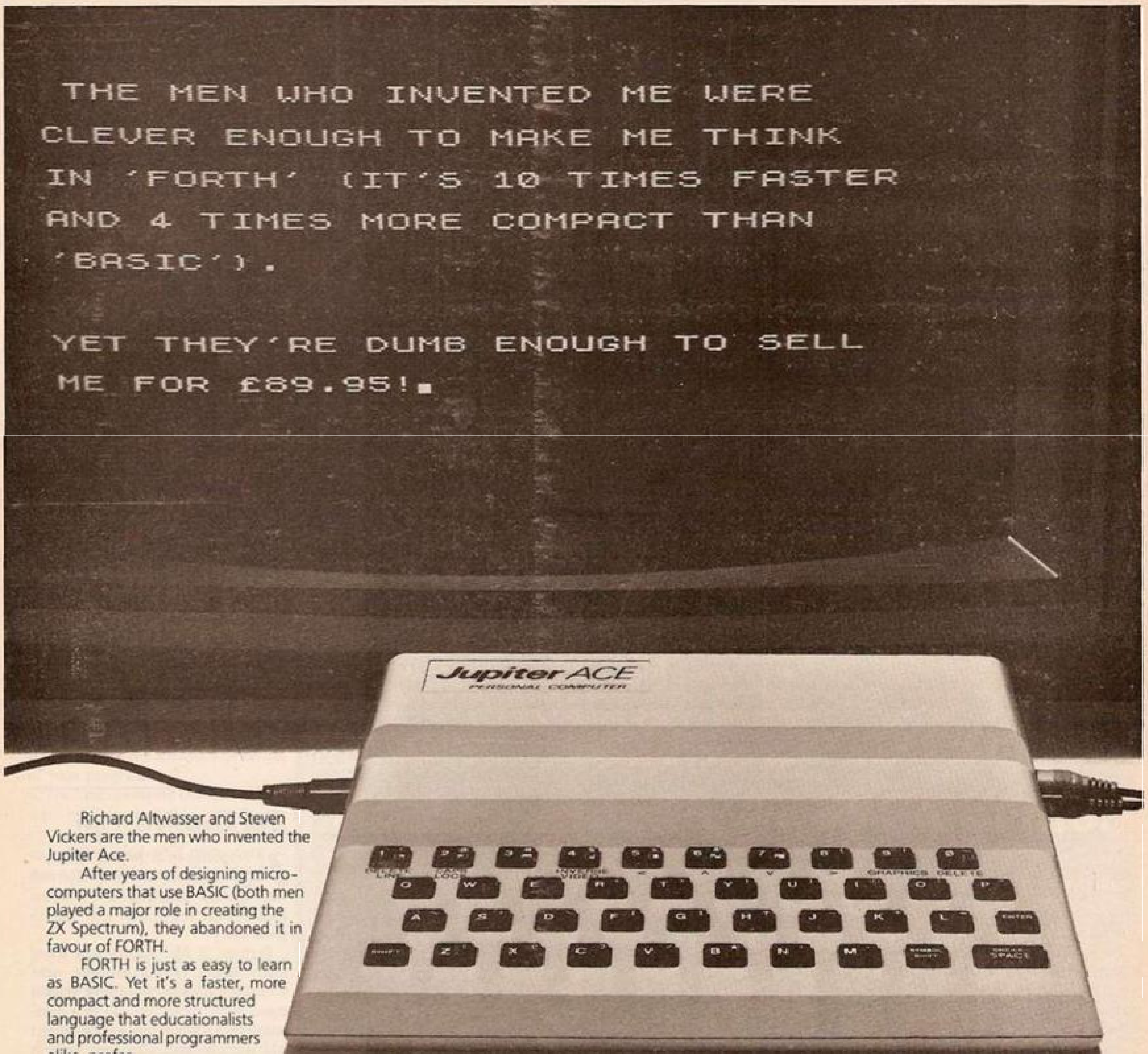
ORIC PRODUCTS INTERNATIONAL LTD, COWORTH PARK, LONDON ROAD, ASCOT, BERKS

JUST LAUNCHED

ORIC TREK SPACE ADVENTURE GAME

You are in command of the Federation's most powerful starship the USS Enterprise. Armed with your phasers and photon torpedoes, your task is to patrol the furthest reaches of the Galaxy, protecting Federation space against the forces of invading Klingons. Your ultimate mission is to rid the Galaxy entirely of the Klingon menace... before they destroy you. Your crew awaits you aboard the Enterprise. Starfleet Command wishes you Bon Voyage and Good Hunting!

ORIC products available from:-
WHSMITH ● DIXONS ● GREENS
LASKYS ● MICRO'C' ● MICRO PERIPHERALS ● SPECTRUM COMPUTERS FOR ALL
And hundreds of independent dealers.



Richard Altwasser and Steven Vickers are the men who invented the Jupiter Ace.

After years of designing micro-computers that use BASIC (both men played a major role in creating the ZX Spectrum), they abandoned it in favour of FORTH.

FORTH is just as easy to learn as BASIC. Yet it's a faster, more compact and more structured language that educationalists and professional programmers alike prefer.

So the Jupiter Ace is the only micro-computer you can buy that is designed around FORTH.

Using it, there's little fear of accidentally 'crashing' programs halfway through and having to start all over again (a common fault with BASIC). The Jupiter Ace's comprehensive error checking sees to that.

The Jupiter Ace has a full-size keyboard, high resolution graphics, sound, floating point arithmetic, a fast, reliable cassette interface, 3K of RAM and a full 12 month warranty.

You get all that for £89.95. Plus a mains adaptor, all the leads needed to connect most cassette recorders and T.V.'s, a software catalogue (35 cassettes available, soon to be 50), the Jupiter Ace manual and a free demonstration cassette of 5 programs.

The Jupiter Ace manual is a complete introduction to personal computing and a simple-to-follow course in FORTH, from first principles to confident programming.

Plug-on 16K and 48K memory expansions are also available, at very competitive prices. (There'll be a plug-on printer interface available soon, too.)

It'll take you no time at all to realise how clever Richard and Steven were to design the Jupiter Ace around FORTH. And even less time to realise what a silly price £89.95 is to charge for it.

__Technical Information__

Hardware
Z80A; 8K ROM; 3K RAM.

Keyboard
40 moving keys; auto repeat; Caps Lock.

Screen
Memory mapped 32 col x 24 line flicker-free display upper and lower case ascii characters.

Graphics
High resolution 256 x 192 pixel user defined characters.

Sound
Internal loudspeaker may be programmed for entire audio spectrum.

Cassette
Programs and data in compact dictionary format may be saved, verified, loaded and merged. All tape files are named. Running at 1500 baud.

Expansion Port
Contains D.C. power rails and full Z80 Address, data and control signals. Can connect extra memory peripherals.

Editor
Allows complete editing and listing of compiled programs.

Please send cheque/postal order to:
Jupiter Cantab, 22 Foxhollow, Bar Hill, Cambridge CB3 8EP.

Jupiter ACE

Please send me ________ Jupiter Ace microcomputers @ £89.95 (+ £3.95 p. & p.)
Tick here if you require VAT receipt ☐

Name ________________________________

Address ________________________________

0020183

Available for immediate delivery. Allow 14 days for p. & p. U.K. price only (export price on request).

SPECTRUM TV PROBLEM

Many Spectrum owners have not been able to obtain a colour display on certain colour televisions. They have a sharp monochrome display at one position of the TV tuner and distorted colour display at another. My solution is as follows: First, remove the five screws from underneath the casing and turn the computer upright; then carefully lift the top part of the casing so that it is just clear of the circuit board. Move it down over the rest of the casing taking care not to tension the keyboard ribbon cable.

Between the ULA and PAL encoder — see introductory manual page 29 — you will find four adjustable screws. These are used to tune the two separate outputs of the ULA which are related to the contents of the display file and the colour attributes. Next, connect the computer to the television as normal and create a colour display, for example

```
BORDER 1: PAPER 2: CLS
```

Note carefully the initial positions of the screws mentioned previously. Using a screwdriver adjust the top three of these screws until the colours appear on the display, starting with the resistor marked 2.2Kr. If after a period of time the colour disappears then further adjustment is needed. The bottom screw may also be adjusted if necessary. If this procedure fails then return the screws to their original positions. Finally, reassemble the casing, turn over and replace screws.

These alterations are both simple and perfectly safe and should put life into many a Spectrum display.

Mark Nolan, Malahide, Dublin.

MAZE CRAZE

A number of people seem to have had a problem with Maze published in the March edition of *Your Computer* The misunderstanding probably lies in line 5008, which reads

```
5008 LET d$ = "↑ <>v"
```

The string in this line should contain four characters — up-arrow, less-than, greater-than and lower-case v. The symbol in the middle is not the Sinclair unequal sign, although the two look the same on the listing.

In addition, it is worth typing Clear before saving the final version on tape — this prevents all the variables being dumped on to cassette.

Colin Carruthers, Edinburgh.

THE CURE

I built my ZX-81 from a Sinclair kit. After some teething troubles I had about six months of daily use without a hitch. Then the loading problems started. It was hit and miss, the trend became an increasing number of missed loadings. Something had to be done.

All the favourite cures had been tried, different volume settings; cleaner tape passed through; different types of tape; clean heads with meths and cotton wool buds; developed eye ache looking at loading patterns on the screen in an endeavour to interpret them; purchase and use of head demagnetiser.

It may sound silly but I suspect that many other computer "nut cases" are also guilty of not using the Tape Recorder for the purpose for which it was intended. During a bout of frustration I listened to one of my favourite recordings and there was a lot of background hash. At first I accepted the poor signal/noise ratio as the quality standard of the recorder. But I became sure that the recorder did a better job some months ago. What if the computer was upset by this hash? I rooted out a capacitor substitution box and connected between the Ear input and earth of the recorder. The best de-coupling value was found by a marked reduction in the noise.

I obtained a suitable capacitor and soldered it into the recorder. That was over six months ago and loading has been no problem.

G Winterburn, Lytham, Lancashire.

SINCLAIR TRICKS

I have found out three things which may prove useful to Spectrum owners. The first is how to break into programs, which upon loading jump to some machine code. Type in the following.

```
999 Merge "" STOP
```

Load in the program, and when the loading is completed, the computer will display a Stop error code. You now have access to the program. The second, and most useful thing I found out, is how to disengage the Break key.

The trick in doing this, is to Poke down the screen to 24 lines deep at the beginning of your program. At any attempt to break into the program the screen will fill, and the computer will get lost in an endless loop. This happens because when the Break key is pressed, an error code appears. As the computer is used to printing on the bottom two lines, it will not like it if the two lines are not accessible. This results in a crash.

If at any time in the program you do need to re-engage the Break key, include a line which Pokes back to two lines. The pokes are as follows:

```
POKE 23659,0 disengages
POKE 23659,2 re-engages
```

The third thing I found out is how to print on the bottom two lines. The function "Print # 1; "Hello" will print hello on the bottom two lines. This is best demonstrated by typing in this short program.

```
10 Print # 1; CHR$ (RND*127+33):
   GOTO 10
```

Random characters could be printed on the bottom two lines. As the text goes over the line, the area expands to three lines, then to four, and so on. The machine code equivalent of this instruction is RST16, which prints the CHR$ of register A. I hope these few tricks will prove handy to Spectrum owners.

D J Whale, Harlow, Essex.

BBC MONITOR

Richard Harris's monitor program for the BBC Micro published in March *Your Computer* is excellent but happens to have one mistake. The label

```
650 .back DEC &80
```

The monitor can be further enhanced by printing the ASCII values when listing an eight-by-eight block and this is achieved by changing the following lines.

```
40 data1 = P$ + 965:data2 = P$ + 1120:
   data3 = P$ + 1275
50 mess = P$ + 1430:XYmess = P$ +
   1645:pmess = P$ + 1680
60 data4 = P$ + 1685:sptab = P$ + 1755
   :REM SET BASE ADDR OF DATA
```

These lines create the extra space required for new code inserted to print the ASCII values in block print. Following additions are required to achieve this. Replace lines 920 to 1110 with the following:

```
920 .block
930 LDA #8
940 STA &82
950 LDY #0
960 .cd LDX #8
970 STX &83
972 LDA &80
973 STA&84
974 LDA&81
975 STA &85
980 JSR newlin1
990 JSR addrpr
1000 .bc LDA (&80),Y
1010 JSR print
1020 LDY #1
1030 JSR space
1040 INC &80
1050 BNE ab
1060 INC &81
1070 .ab DEC &83
1080 BNE bc
1081 LDX #8:STX &83:LDY #2:
     JSR space
1085 .bf LDA (&84),Y:CMP # &20:
     BCC bw:CMP # &7E:BCC br
1086 .bw LDA # &2E
1090 .br JSR &FFEE
1091 INC &84
1092 BNE bh
1093 INC &85
1094 .bh DEC &83
1095 BNE bf
1096 DEC &82
1100 BNE cd
1110 JMP ff
```

Finally change lines 2430 to 2440 to:

```
2430 .newlin:JSR &FFE7
2440 .newlin1:JSR &FFE7:RTS
```

These changes will allow the user to locate data areas easily and will also help him to look more closely at the BBC OS and Basic Roms. I hope other users find these changes of use.

Deepak Laxman, Godalming, Surrey.

DEFENDING TIM

In response to A Jaques' letter — March edition — Mr. Hartnell was merely pointing out various ideas which the reader may put to good use.

Perhaps if Mr. Jaques had spent many hours of his valuable time writing programs he might understand what piracy can do to a company: his attitude typifies the person who simply wishes to have endless hours of fun without giving those who make it possible their just

NOSTALGIA AND PROGRESS

Thank you for your timely words of wisdom in the March issue editorial in respect of the current low-price computer war.

I own a UK-101, and over several years have upgraded it to 32K RAM, 16K ROM, a multi-dimension screen format including a useful 32 × 64, 8912 PSG, a PIA, VIA etc, with the inclusion of the Cegmon screen editor and machine-code monitor. I was beginning to develop an inferiority complex being restricted to block graphics only. As a matter of interest I ran the speed program in the Oric versus Spectrum article and was pleasantly surprised to achieve Load Array and Sort Array times of eight and 190 seconds respectively taking up 225 bytes of program space and 4041 bytes of variable space. The machine runs at 1Mhz which can also be upgraded.

Instead of buying one of the new plastic-case tortoises I will now return to my steel-clad monster — although not up to the size of the Manchester Mark I computer — and build a high-resolution and colour board with its own RAM leaving me with a full 32K memory less workspace — about 770 bytes — while I wait for the "ultimate" computer.

N L Smith, Stoke-on-Trent, Staffordshire.

reward. If Mr Jaques would look in the March 1983 Response Frame he would see there a letter written by someone who had tried to break into a program to copy it.

I regard *Your Computer* as the most user-friendly magazine available and quite simply the best at helping the user in trouble. Perhaps if Mr Jaques had experienced loading and output problems and suffered the frustration of it all then he would understand how valuable a service *Your Computer* is. I did not find any points technically related to a machine in Mr Jaques' letter.

Michael Gregory,
Guisborough,
Cleveland.

BELGIAN VIC

Living in Belgium, I am the proud owner of a Vic-20. When attempting to load a program from cassette, it can be very helpful to listen to the cassette signals. This can be achieved by simply connecting a standard earphone to the Vic's cassette connector. It does not need an amplifier and cannot damage your Vic at all. Just connect the earphone leads parallel on pin A1 — ground — and pin D4 — read — of the cassette connector. See the user manual on page 151 for the pin configuration. Once connected you will both hear the loading and saving of your programs.

The synchronising header, checks, um, bytes and double storage are three good error-checking techniques used by Commodore to make their tape system very reliable.

Manuel Allaert,
Ostend,
Belgium.

FAST GRAPHICS

I apologise to readers using the machine-code routine described in my article on fast animated graphics for the Spectrum who have found that it does not work correctly when "Width" is greater than 16-bits. The culprit is a missing instruction LD (IX+9), 8 which should come between the instructions EX HL,DE and L4 DEC (IX+8) in listing 3. If you have your original version of the machine-code routine "Animate" on tape, then you should obtain a corrected version as follows: reset RAMtop to 65159 — 48K — or 32389 — 16K — with the appropriate clear command. Load your old version of "Animate".

Enter and run this Basic program:

```
10 Let A = 65160 (32390 for 16K)
20 POKE A + 158, 24
30 POKE A + 159,37
40 FOR B = A+197 TO A + 204
50 READ C : POKE B, C
60 NEXT B
70 DATA 78, 235, 221, 54, 9, 8, 24, 211
80 SAVE "ANIMATE" CODE A, 205
```

Robert Newman,
Oundle,
Peterborough.

EDITORIAL

YESTERDAY YOU WERE impressed by your bargain buy — £200 for a whole microcomputer. Today the smile of the proud new owner fades on your face as you see the same machine at the revised official price of £150. You rush to the calendar: it's too early for the summer sales, and April Fool's Day is long past. Then you recall something you read in last month's *Your Computer:* a Commodore spokesman, when asked to deny persistent rumours that new technology makes the £350 Commodore 64 cheaper to produce than the old £130 Vic-20, would only say that price "was all to do with what the market will bear — not to do with what it costs to make".

This is a clear statement of fact and nothing which should astonish or outrage us. After all British motorists have to pay more than the rest of Europe for the same cars.

Why then should we be surprised to learn that in the vast U.S. market, the ZX-81 — or Timex 1000 — can cost as little as £36 even though most Americans have larger disposable incomes, that the Stateside Spectrum is less than £100 for a machine with a higher specification, and that similar stories can be told about Ataris, TI-99/4s and any other micros you care to name?

You remember being told and not believing that the components inside a Spectrum could cost Sinclair as little as £15 and you begin to wonder if the £50 price cut after you bought your micro could just as easily have been £75 or perhaps even £100.

Before writing off micro pricing as a black art, you should understand how it works. Prices drop because products are in competition with newer or cheaper technology. If a micro-maker has the skill to be first on the market with a new kind of product, that company can inflate the asking price to as high a level as it believes the market will take. Then, as the competition arrives to share the pickings, the first company will deflate the price to try and increase the volume of sales and so maintain or even improve profits.

As the market grows, production costs tumble partly because the more integrated circuits the chip-builders produce, the smaller the percentage of faulty circuits — and that means increased yields and lower unit costs. Of course you can come a cropper if the original price is too high. The excellent TI-99/4 was the first 16-bit colour home micro and cost about £750 when it was introduced in 1980. As other machines appeared, the TI-99/4's price had to be dropped progressively to its current level of £150 to remain competitive with the newcomers. Some would argue that its original price asked too much of the U.K. market and damaged the micro's prospects in the long run. A £350 price tag for a machine of such a calibre in 1980 might have given the TI-99/4 a vast user and software base in Britain.

Clearly there are concealed costs beyond the price of components. Companies have to allow for research and development, labour, production overheads, packaging, distribution, marketing, margins for retailers and even the expense of maintaining the jammed switchboard of the customer complaints department. But when you add all that up, the gap between costs and price can still be very large. Perhaps that explains why so many new companies are bravely rushing into computing to fill the breach.

How to write for *Your Computer*

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticism of machines and software in general. If you would like to see your name in print, whether on a Software File program or a full-blooded article, here is how to go about it. Ideally, all articles should be typed double-spaced on one side only of uniform sheets of paper. If listings can be dumped directly from a printer — you can always use a friend's or user group's — this minimises the risk of error. In a perfect world a cassette would accompany the article. That considerably speeds up the checking process. Not only do you get to air your own discoveries and opinions, but we will even pay you for the privilege. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

Why not give it a try? You have nothing to lose but your postage.

Editor
TOBY WOLPE

ABC

Assistant Editor
MEIRION JONES

Staff Writer
SIMON BEESLEY

Sub-editor
PAUL BOND

Editorial Secretary
LYNN COWLING

Editorial: 01-661 3144

Your Computer, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Subscriptions: U.K. £8 for 12 issues.

Printed in Great Britain for the proprietors Business Press International Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Tel: 01-661 3500 Telex/grams: 892084 BIPRESG. ISSN 0263-0885. Printed by Riverside Press Ltd, Whitstable, Kent, and typeset by Instep Ltd, London EC1.

Advertisement Manager
PHILIP KIRBY 01-661 3127

Assistant Advertisement Manager
PETER RICE 01-661 8441

Advertisement Executive
BILL ARDLEY 01-661 8484
NIGEL BORRELL 01-661 3127

Midlands Office
KEITH SALT 021-356 4838

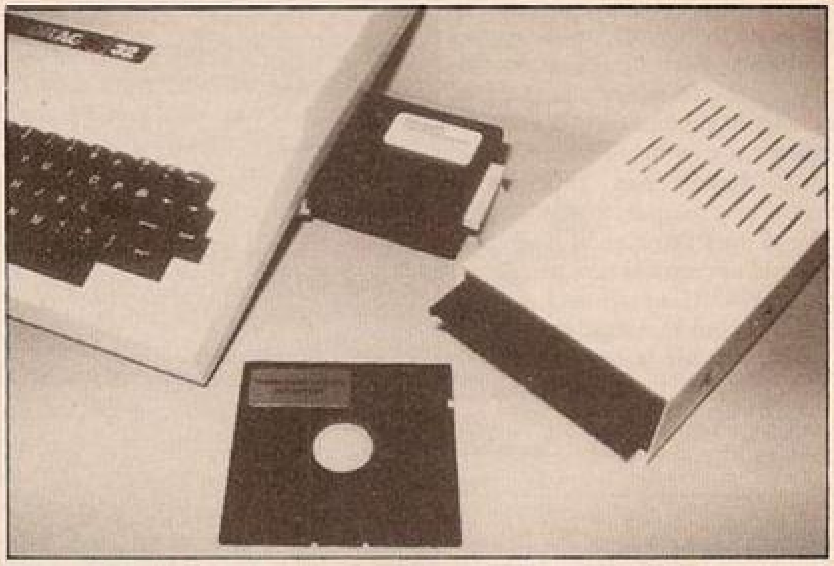
Northern Office
RON SOUTHALL 061-872 8861

Advertisement Secretary
JEANETTE MACKRELL

Classified
CLAIRE NOTLEY 01-661 3036

Publishing Director
CHRIS HIPWELL

Premier disc system — a first for Dragon 32



NOW THERE IS a disc system for the Dragon 32. Premier Publications has incorporated a Disc Operating System and disc controller in a single cartridge which plugs into the games cartridge port.

The Disc Operating System supplies a comprehensive set of commands which appear to the user as an extension of Basic. As well as standard facilities for creating and deleting files, reading the directory, disc formatting, renaming files, there is also provision for opening up to eight random and sequential files simultaneously.

Two unusual features are the Find and Config commands. Find enables data files to be searched for a string match. Config allows the user to configure the system to run with almost any type of floppy-disc drive available. The number of tracks, sides and sectors per track on a disc can all be specified to allow the system to support 3, 5.25 and 8 in. drives. In addition the controller cartridge can cater for up to four drives at a time, in any combination.

The cartridge comes with a 74 page manual and costs £99.95. Premier Publications is also selling complete systems, starting with the Delta 1 at £299.95. This includes the controller, cables, and a 40-track Canon disc drive with a capacity of 100K. Premier Publications is at 208, Croyden Road, Anerley, London SE20 7YX.

Spectrum goes organic while ZX-81 grows to one megabyte



THIS MONTH Basicare is releasing an interface which will enable Spectrum owners to use most of the modules in the company's Organic Micro system which is now available for the ZX-81.

These include a CMOS RAM module backed by battery for non-volatile program storage, Toolkit, an interface to take up a 8K of utility programs stored in EPROM or ROM, and a sound synthesiser module. There is also a general purpose interface providing 24 input/output lines and a Centronics interface to link the ZX-81 or Spectrum to most printers.

On the ZX-81 the printer interface is accompanied by a program which prints ZX-81 graphic characters on Epson and Seikosha printers.

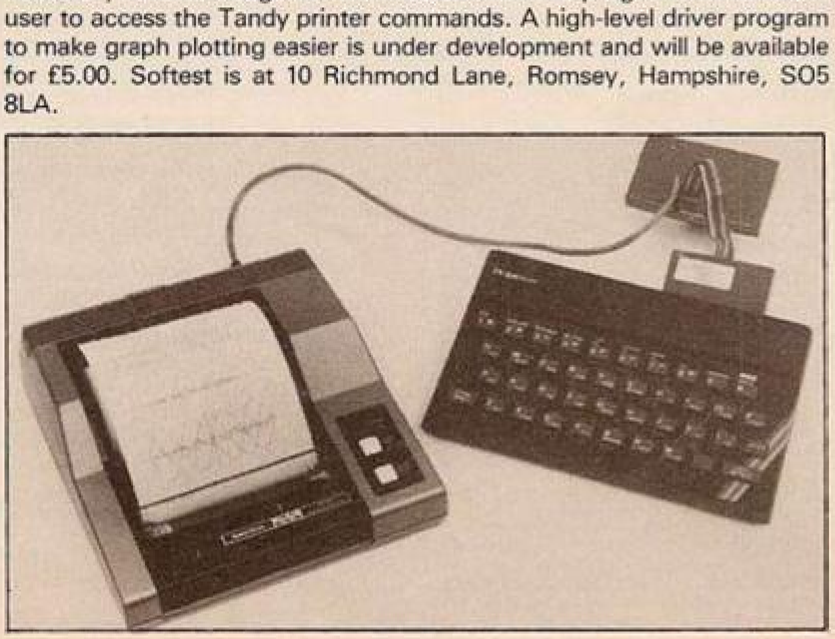
The modules can be stacked on top of each other and are interfaced to the computer through the Persona module which communicates with the other devices via a 64-way bus.

One feature that sadly will not be available for the Spectrum is the Minimap module. This enables ZX-81 owners to access up to one megabyte of RAM. Only 64K can be read at one time but up to 16 pages of 64K can be switched in and out using a single Poke instruction.

Analogue to digital, and digital to analogue converters for both the ZX-81 and Spectrum will also be released. Future developments include a joystick controller and a fast cassette loading device.

The Personal module costs £30.25 and the Minimap £35.95. Prices for the other devices range from £22.20 for Toolkit to £76.25 for 64K RAM. Basicare is at 12 Rickett Street, London SW6. Tel: 385 2135.

Spectrum owners can now link their micro up to the £149 Tandy colour printer. Softest is selling an interface package for £35. It includes the necessary hardware together with cables and three programs which allow user to access the Tandy printer commands. A high-level driver program to make graph plotting easier is under development and will be available for £5.00. Softest is at 10 Richmond Lane, Romsey, Hampshire, SO5 8LA.



Millionth U.K. micro sold

THE END OF APRIL marks a milestone for home computing — with the sale of the home computer in Britain. There are more ZX-81s out there than anything else followed by Spectrums, Vic-20s, BBC Micros, Dragons, TI-99/4s and a dozen other computers.

BBC Music Processor

QUICKSILVA MUSIC Processor turns your BBC Micro into a tape recorder and synthesiser for just £14.95, Andy Williams the author of the program, started working on it in May last year. He says that if he had worked full time it would still have taken him six months to complete.

Business Press

THE NAME of *Your Computer's* parent company has been changed from IPC Business Press Ltd to Business Press International Ltd. This change has been made to reflect the very wide range of markets covered by the 100 publications of the company, and to identify its prime position as the world leader of business publishing.

Ikon's Hobbit for the BBC Micro runs rings around conventional cassette storage

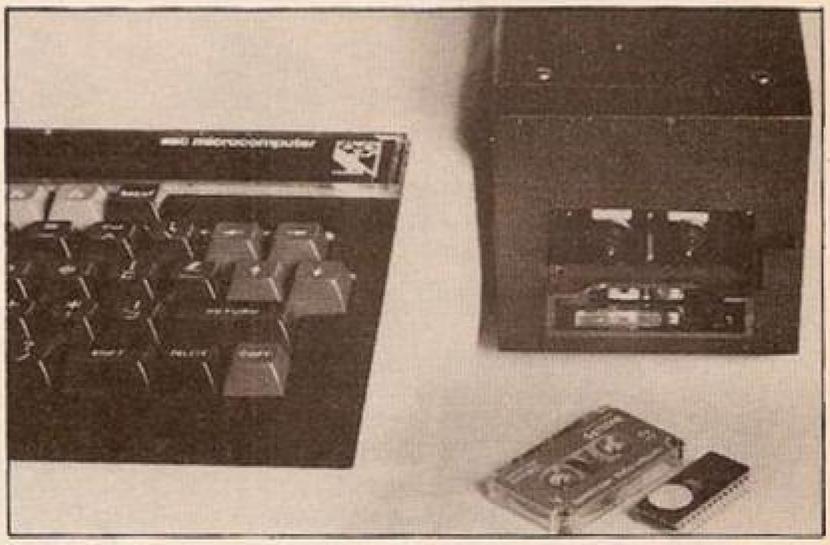
YOU'VE READ THE BOOK, you've seen the film, now buy the floppy tape drive. Hobbit is the name of a new storage unit for the BBC Micro which is faster than cassette and cheaper than disc storage. It reads and writes at almost seven times the rate of the standard cassette, and also offers many of the housekeeping facilities of a disc system.

Ikon Computer Products, which makes the Hobbit is supplying it with an EPROM which contains the floppy tape equivalent of a disc-operating system and takes care of such tasks as locating a program on tape and updating a directory. All of the standard BBC file commands are supported as well as a few extra commands which are specific to the Hobbit.

The Hobbit has similarities to Sinclair's Microdrive but whereas the Microdrive will use a continuous loop of tape, tape on the Hobbit can be moved backwards and forwards. The average access time is 20 seconds with a maximum of 90 seconds.

Two drives can be connected to the BBC through the user port. Each takes a cassette with a capacity of 60K per side.

Perhaps Ikon should have considered calling the £155 Hobbit after another furry animal — the rabbit in *Magic Roundabout* — because Ikon is based at Kiln Lake, Laugharne, Dyfed — which used to be the home of Dyan Thomas.

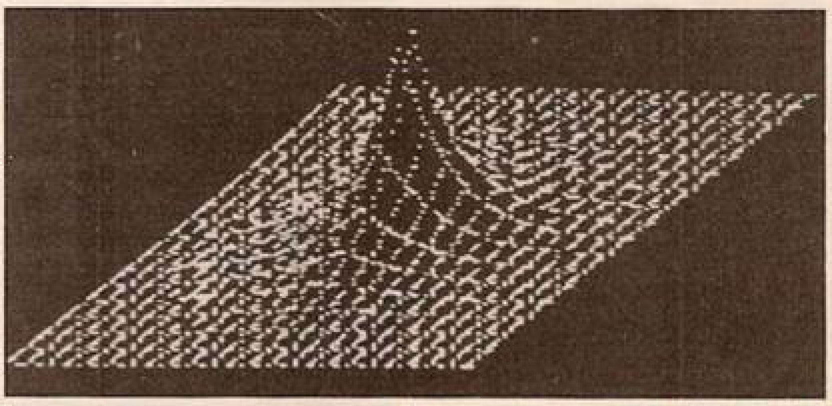


80K for £300 coming soon

LATE NEWS of an 80K home micro about to be announced by one of the world's biggest micro makers. The machine will set new standards in BBC Micro, Commodore 64 country and will cost around £300. More details next month.

High resolution Sinclair tape from self-taught schoolboy

RICHARD TAYLOR, a 14-year-old schoolboy, has found a way to improve the ZX-81's 64×44 pixel resolution without using any extra hardware. Until now high resolution on the ZX-81 could only be obtained from high-res graphics boards costing over £50. Richard Taylor's program, High Resolution, comes on a cassette and gives a resolution of 256 by 192.



The program takes up around three-quarters of a K and creates its own display file which consumes a further 6K. It allows you to plot points, invert points, save and load a high-res picture, and also to define new characters.

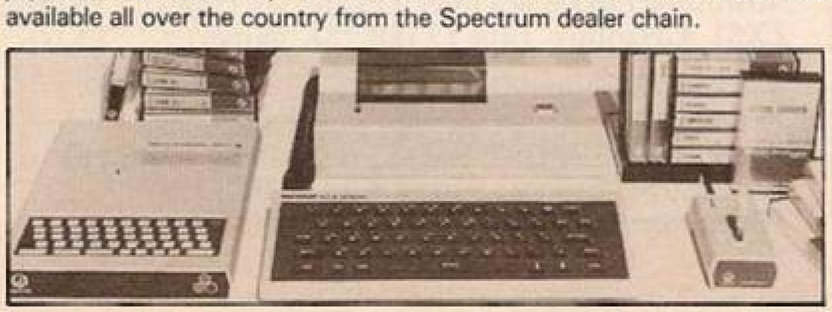
Like most of the other programming whizzkids Richard Taylor is entirely self-taught. He finds rewriting the operating system easier than devising games. "There is no point in doing what everyone else is doing", he explained and added "I like to make a machine do what it's not designed for". He has now moved on to the Spectrum and is working on a program to give the Spectrum a genuine 36 colours.

The High Resolution program costs £5.95 and is available from Computer Rentals, 140 Whitechapel Road, London E1.

Android Attack on the trail of Dragon Donkey King

FLUSHED WITH the success of its top-selling Dragon program Donkey King, Microdeal has now released five new programs for the Dragon. Android Attack is based on the arcade game Beserk, includes some limited speech synthesis and routinely announces intruder alert or charges the player with cowardice. Galactic Ambush and Cosmic Zap are Microdeal's versions of Galaxians and Space Fortress. Program packs 4 and 5 each contain nine short programs. These tapes are available from Microdeal and Dragon dealers for £8 each.

Remember the MPF II — the £269 colour computer we scooped last October? At the time our reviewer complained that it was a good machine let down by a dreadful keyboard. Here it is with the £36 full-size keyboard, joystick, £185 thermal printer and some software all of which are now available all over the country from the Spectrum dealer chain.



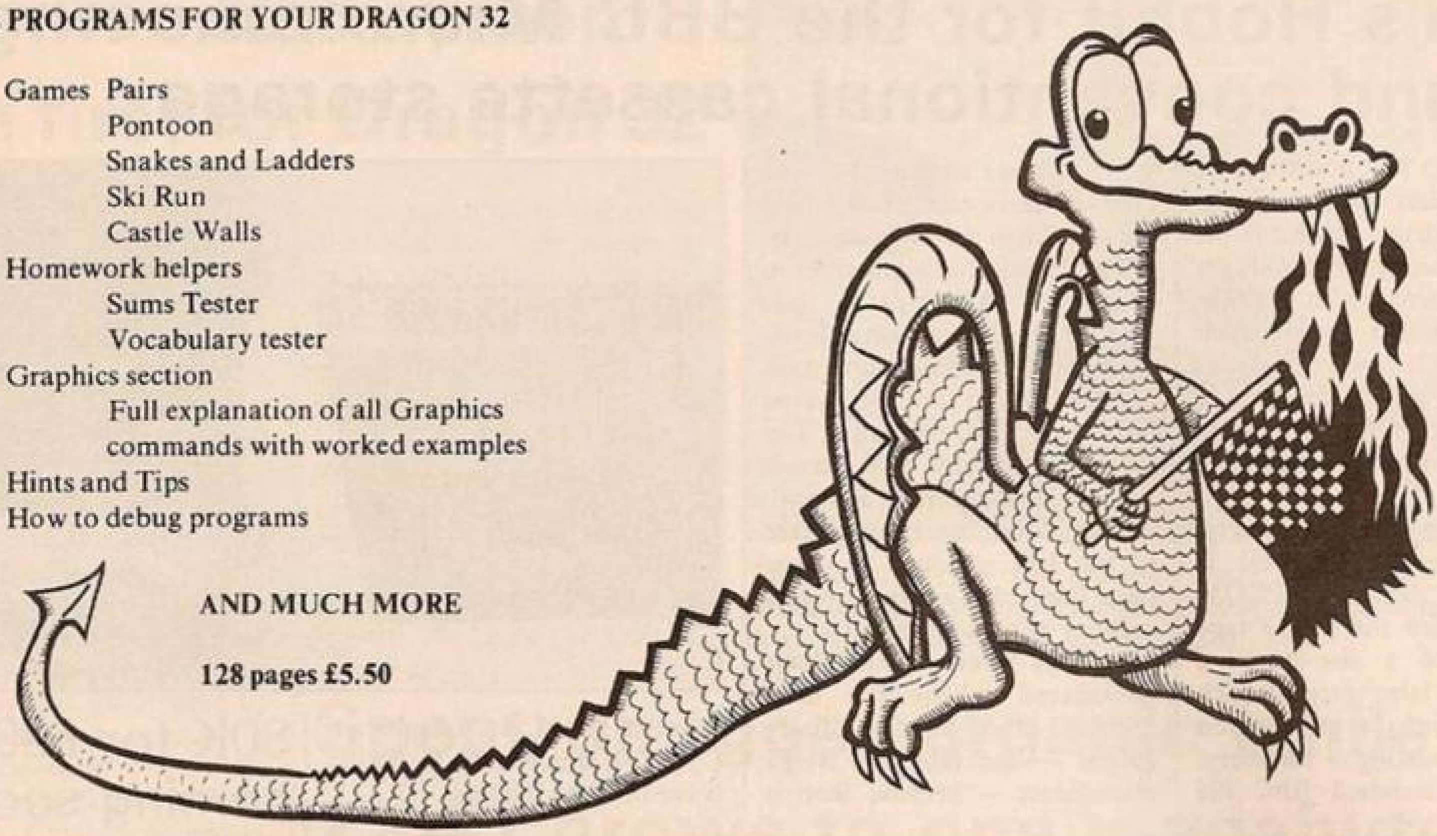
YOUR COMPUTER TOP 20

Game	Company	Machine
Arcadia	Imagine	Spectrum
Choplifter	Creative Software	Vic-20
Choplifter	Broderbund	Atari
Donkey King	Microdeal	Dragon
Dragon Trek	Salamander	Dragon
Flight Simulation	Psion	Spectrum
Flight Simulation	Psion	ZX81
Hobbit	Melbourne House	Spectrum
Kong/Dracula	Tony Barber	ZX81
Moons of Jupiter	Romik	Vic-20
Penetrator	Melbourne House	Spectrum
Planet Invasion	Microdeal	Dragon
Rocket Raid	Acornsoft	BBC
Sea War	Panda	ZX81
Synapse	Fort Apocalypse	Atari
Snapper	Acornsoft	BBC
Time Gate	Quicksilva	Spectrum
3D Defender	New Generation	ZX81
Traax	Llamasoft	Vic-20
Zaxxon	Datasoft	Atari

LOAD AND GO WITH YOUR DRAGON

32 PROGRAMS FOR YOUR DRAGON 32

- Games Pairs
  - Pontoon
  - Snakes and Ladders
  - Ski Run
  - Castle Walls
- Homework helpers
  - Sums Tester
  - Vocabulary tester
- Graphics section
  - Full explanation of all Graphics commands with worked examples
- Hints and Tips
- How to debug programs



AND MUCH MORE

128 pages £5.50

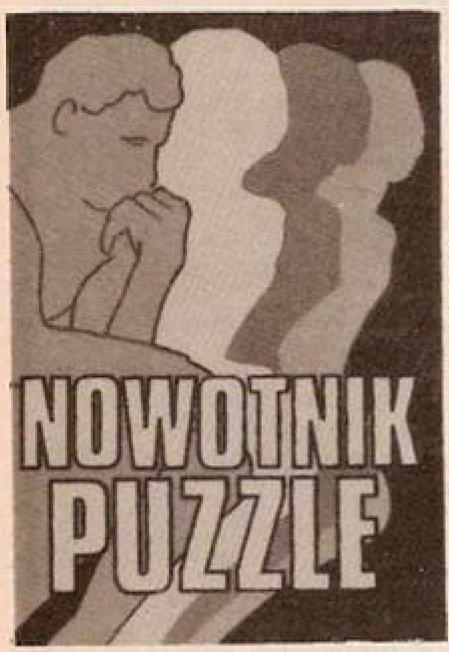
PHIPPS ASSOCIATES

Dept A FREEPOST EM463 (No stamp required)
99 East St, Epsom, Surrey KT17 1BR.
Telephone 03727-21215. 24hr phone service.

Prices include postage but for air mail delivery in Europe add 90p (outside Europe add £1.70) per item.

Access and Barclaycard accepted

NOWOTNIK PUZZLE KNIGHT'S QUEST



For either the 16K Spectrum or 16K ZX81, this is an original challenge for anyone. The screen becomes the playing board for this addictive puzzle. ***Machine coded*** for smooth and instant responses, it offers four levels of difficulty. The computer breaks and shuffles a two-by-two coloured square - have you the skill and mental agility to restore it? ***"Very addictive"*** - ZX Computing Feb/March 1983.



A full-blooded adventure for the 48K Spectrum using split-screen ***graphic pictures*** and a scrolling text window. You must find Merlin's lost treasure, battling elves, scorpions, dragons; rescue a princess from the evil Wizard of Trill – it goes on and on! Over 120 locations plus a full English command line scanner, ***machine coded*** for fast recognition. Truly state-of-the-art! Also available for the 16K ZX81.

ZX SPECTRUM

Knight's Quest (48K)	£5.95
Nowotnik Puzzle (16K)	£4.95

ZX81

Knight' Quest (16K)	£4.95
Nowotnik Puzzle & Other Diversions (16K)	£5.00
ZX81 Adventure Tape (3 full 16K games)	£5.00

PHIPPS ASSOCIATES

Dept A FREEPOST EM463 (No stamp required)
99 East St, Epsom, Surrey KT17 1BR.
Telephone 03727-21215. 24hr phone service.

Prices include postage (outside Europe add £1.00) per item.

Acornsoft Castle of Riddles: the knights errant receive rewards



From left: runner-up C P Bignell; *Your Computer* editor Toby Wolpe; winner Peter Voke; Acornsoft's David Johnson-Davies; and in third place P K Colbert.

A DAWN CROSS-COUNTRY DASH from Littlehampton on the Sussex coast to *Your Computer's* offices on the outskirts of London just failed to clinch first prize in the £3,000 Castle of Riddles competition for 34-year-old company director Colin Bignell. Only 20 minutes before Colin Bignell's car drew up outside the *Your Computer* headquarters, Peter Voke of Aylesbury, Buckinghamshire was safely delivering the winning entry into the hands of editor Toby Wolpe.

Third past the post was Peter Colbert, a Cardiff-based British Telecom programmer. He put his faith in his colleagues at the Royal Mail and entrusted his entry to the vagaries of first-class. He had solved the riddles in six hours — two hours faster than the other prize-winners. Both he and Colin Bignell each receive £400 of Acorn equipment, while Peter Voke won the £700 silver "King of the Ring" trophy and £1,500 of Acorn hardware.

At the top of his shopping list is a dry ink-jet printer, followed by a small disc drive and a second processor. The two runners-up have set their sights on disc drives, although Peter Colbert also finds the voice-synthesis chip a very attractive proposition. His six-hour session that solved the Castle of Riddles started on a Saturday morning and ended early in the aftrnoon of the same day.

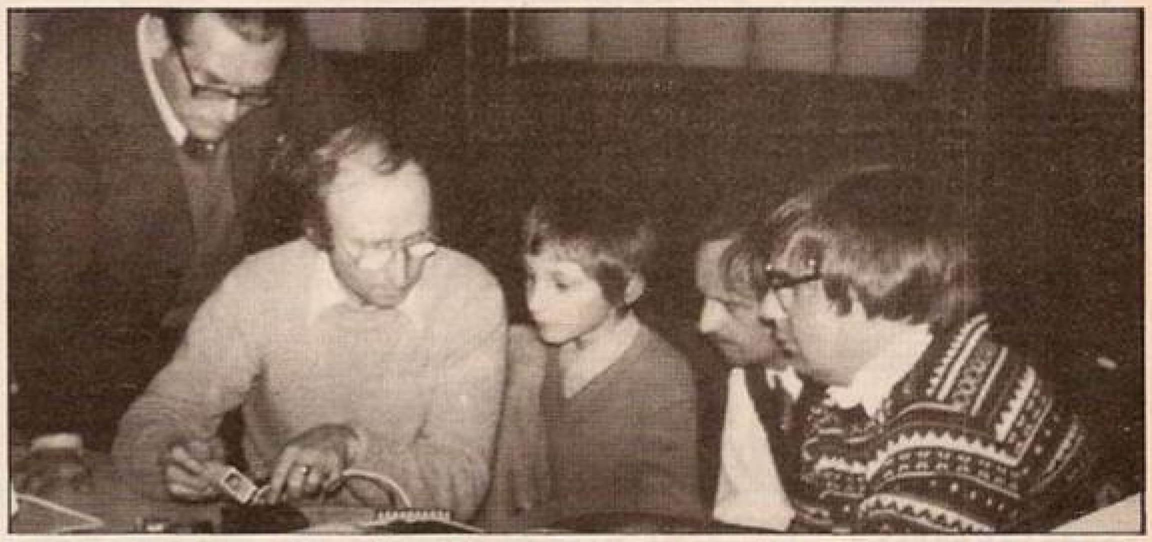
Although the cassette had arrived two days before, his wife was against his spending all night at the keyboard.

Away from the cut and thrust of the world of adventures, "King of the Ring" Peter Voke confides that time spent away from the keyboard and, above all, moderation are his keys to success. He recommends sleeping sensibly — would-be champions should note that throughout the time he was wrestling with the Castle of Riddles he made sure he got his 10 hours a night.

Computer Club is here to encourage you to start your own local computer club or, if one already exists, to join it and become involved. We would like to hear of anything which has made your club a success, or of any projects or programs you are developing.

BIRMINGHAM CALLING

Birmingham is not only the venue for our Midland Computer Fair at the end of April — it is also the home of a computer club which can be heard broadcasting on local radio. Simon Beesley tunes in to West Midlands Computer Group.



FOR A SMALL club the West Midlands Computer Group is remarkably productive. It puts out a monthly magazine, Databus, has its own 15-minute slot once a week on Radio West Midlands, and also produces its own software. Databus packs into 10 pages a useful mixture of news, articles, programs, programming and software reviews — all contributed by club members.

The driving force behind the club is David Thomson who founded it last August. He teaches at a local school and was initially concerned to provide a forum for the computing interests of pupils once they had left school. He was assisted by three of his ex-pupils in setting up the club.

The three in question are all talented programmers and are considering marketing their software. With the present boom in commercial software sales no doubt it will not be long before they are rubbing shoulders with the Bug-Bytes and Quicksilvas of the business. *Your Computer* — ever quick to spot new talent — can boast that we gave one of them, David Griffin, his first break when we published his game Maze Munch in our December issue. This program for the BBC Micro was one of our most popular and as an amateur programmer myself I was rather disconcerted to learn that it had taken David Griffin just one hour to write.

From its connection with David Thomson's school the club has now broadened out and, according to Databus, includes no less than three astronomers among its 36 members. One of the astronomers uses a ZX-81 to control the movement of his telescope.

Most of the machines in evidence were BBC microcomputers. Holding its own with the BBCs was a customised ZX-81 in full concourse trim, complete with an add-on keyboard, a wooden casing, a Qsave tape-loader and Atari joysticks.

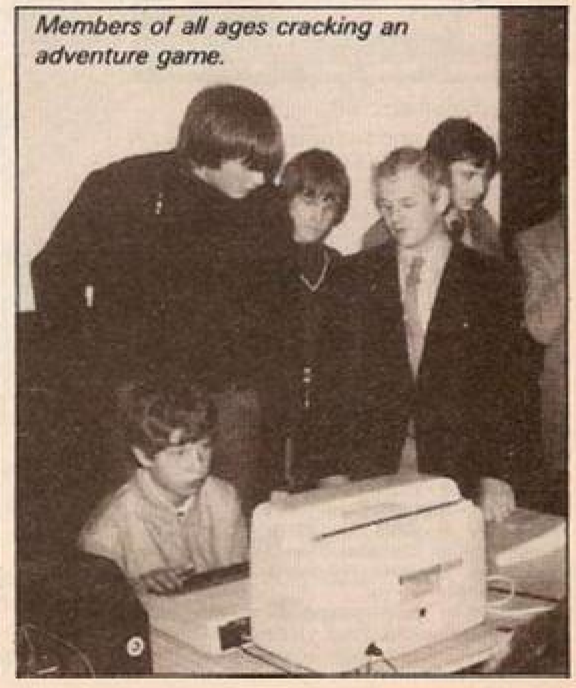
David Thomson suggested that one of the reasons for the BBC Micro's popularity among computer club enthusiasts was the extensive facilities it offers for communicating with the outside world. His own interests are concentrated, as he put it, on the back of the computer and he writes a regular series in the club's magazine on control applications.

At this meeting he demonstrated how to write to the user port on the BBC. Another member had brought along a board fitted with LEDs which plugged into the user port and showed which control lines were in operation.

Elsewhere in the room David Berry, the club's ZX-81 expert, turned his hand to showing a beginner how to write the software which would read joystick inputs on the BBC.

Another group was taking an unconventional approach to adventure games. One of the members had cracked the code which Acornsoft adventure programs use to store their phrases and sentences. He had with him printouts of all the responses that the computer could give in the Castle of Riddles and Philosopher's Quest — a philosopher's crib sheet.

As can be seen, within an informal framework, the West Midland Computer Group's activities are varied and enterprising. The club meets once a month in the Victorian splendour of a room at Birmingham's Central Hall. For more details you can contact David Thomson on Bromsgrove 32242.



Members of all ages cracking an adventure game.

Local society news

Basildon buffs

THERE is now a microcomputer club for the Basildon area. It meets fortnightly on a Tuesday evening at Healey Management Services, The Hemmels, Laindon, Essex. You can telephone Roger Sims on Wickford 63032 after 6.30pm.

Thurnscoe micros

AROUND 70 people attended the first meeting of the Thurnscoe and District Microclub in March. Not all were owners but a straw poll revealed interests in a wide range of machines, from the Spectrum and the Dragon to the Pet and Nascom III. Meetings are held every Wednesday evening at Thurnscoe Comprehensive School, Clayton Lane, Thurnscoe, South Yorkshire. For further information contact Peter Davis on 0709-893880.

Liverpool users

SINCLAIR owners in Liverpool can attend meetings of the ZX Users Club every Wednesday evening at the ZX Computer Centre, 17 Sweeting Street, off Castle Street, Liverpool 2. Anyone is welcome whether they have software or hardware problems, an interest in programs and games, or just a general interest. More details can be obtained from Keith Archer on 051-260-4950.

Enfield brigade

ENFIELD Computer Club caters for the novice and expert alike. Meetings are held on the first and third Monday of each month at Brigadier Youth Centre, Brigadier Hill, Enfield, Middlesex. The annual membership fee is £2 and a further 25 pence is charged at each meeting.

Hewson Consultants

We proudly announce our 1983 range of

SPECTRUM SOFTWARE



40 BEST MACHINE CODE ROUTINES FOR THE ZX SPECTRUM £5.95

By Andrew Hewson and John Hardman

Section A: Three chapters explaining what you need to know about Z80 machine code on the Spectrum.

- How to load and save machine code.
- How to use the system variables.
- How program lines are stored.
- How to use the stack, the display, the attribute files.

Section B: 40 routines including,

- Scroll – up, down, side to side by pixel or by character.
- Search and replace, token swap, string search.
- Rotate character, invert character – horizontally and vertically.
- Line renumber – including GOSUBs, GOTOs, RUN etc.

20 BEST PROGRAMS FOR THE ZX SPECTRUM £5.95

By Andrew Hewson

Program titles include:

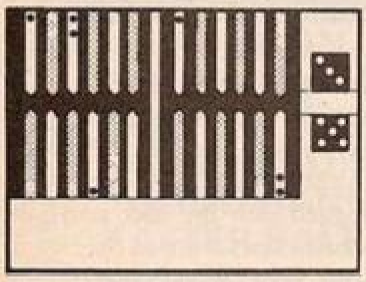
Machine Code Editor – Write, modify, extend and load machine code using this all-basic program. No need to use an Assembler when you have this program.

Index File – Learn about fixed length records, save numeric and string information, add to, sort, modify, delete and print your records. Ideal as a computer based filing system.

Duckshoot – Learn how to manipulate the attributes file *and* have fun at the same time.

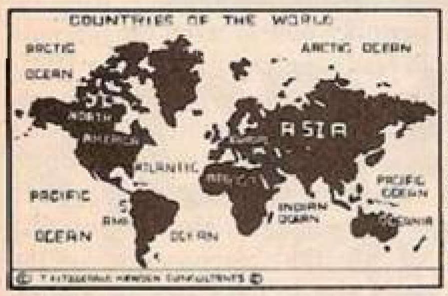
Graphix – Construct up to 210 graphics characters with the full on-screen editing facilities, enhance and modify them and recall them later to build a detailed display to save on cassette.

Plus: FOOTBALL, DIGITISER, DIARY and many more.



BACKGAMMON 16K £5.95

8 Levels of play from novice to expert. Full colour display of tables and dice. Gamble on a single game or a series, double or quits. All the features of the ancient game.



PLUS: Two complete world map screen displays for you to include in your own programs.

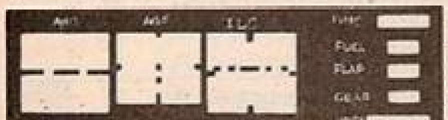
COUNTRIES OF THE WORLD £5.95

16 and 48K on one cassette

Countries of the World is an educational package designed to give an appreciation of the location of all the main countries and some information about them.

16K version displays a world map, shows the position of each country and names its capital.

48K version; all the above plus prints the population, size, currency, and main languages of each country, and statistics on largest and smallest countries etc.



PILOT 16K (ZX81) £5.95

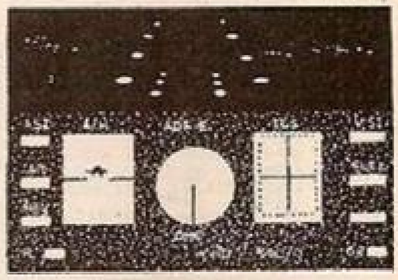
Fly your own aircraft.

Instruments and readouts: A/H, ALT, HDG, FL, GR, VOR, VSI, WIND, DME, ADF, and ILS see "NIGHTFLITE". Essentially the same as "NIGHTFLITE" but without the Hi Res Graphics.



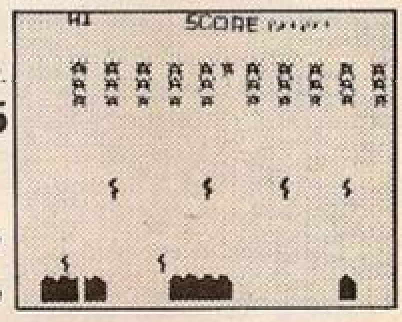
PUCKMAN 16K (ZX81) £5.95

3 Mazes.
Highest score to date.
4 Independent guardians.
Magic strawberries.
Real time scoring.



NIGHTFLITE 16 and 48K £5.95

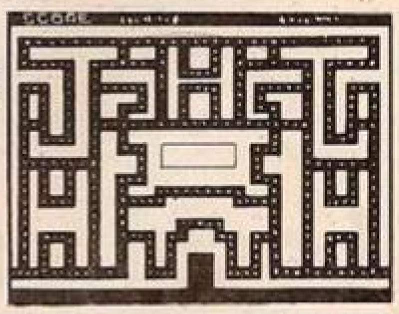
NIGHTFLITE puts you at the controls of a light aircraft flying at night. You can:
Climb, descend, take off,
Land, bank left or right,
Navigate between beacons,
Raise/lower the flaps,
Raise/lower the undercarriage,
Adjust engine rpm,
Raise/lower the nose varying amounts.
Runway lights appear on approach.
5 modes including Autopilot.
Written by a qualified light aircraft pilot.



SPECVADERS £4.95

16K

Defeat each squadron of Beeple Zaps and another appears only closer. Cyrian mothership with ejecting Zeetle Baps. 5 levels of play from Orions snails pace to close your eyes and hope. Real time scoring. 3 lives. Pan galactic gargle blaster for highest score. Descending asteriods.



MAZE CHASE £ 4.95

16 and 48K

4 or 8 Mazes, Highest score to date, 4 independent guardians, 3 lives, Full colour, Fast machine code action, magic strawberries, eat lemons to score more, real time scoring.

ORDER FORM

Make cheques/PO's payable to Hewson Consultants

Quantity	Product	Cost

Name ______ Total ______
(Block Capitals Please)

Address ______ Signed ______

My Access/Barclaycard No. is ______

Post to: **HEWSON CONSULTANTS,** 60A St Mary's Street, Wallingford, Oxon OX10 0EL.
Tel (0491) 36307.

Starting out in home computing? First Bytes is for you. Just write to *Your Computer* with any hardware or software problems, no matter how small or simple.

QUESTIONS

What is a memory map?

'What does the term memory-mapped mean? I have seen it used to describe screen displays on computers.'

YOU CAN THINK of the computer's memory as being composed of a series of boxes. Each box is a memory location and can hold a number between 0 and 255. One area of memory — usually either 8K or 16K — is set aside for the computer's read-only memory" — ROM — which contains the system that allows the computer to interact with you, do calculations, put things on the TV screen, and so on. This area can only be read from, so it is rather like a jar with a lid on because you can see what is inside, by Peeking, but you cannot put new information in — that is called Poking.

One further area is reserved for the information which is displayed on the screen, and it is this area that you refer to in your question. The locations in this case are in "random access memory" — RAM — and this means that information can be read from and written to them. So you can both put new information in these locations — which amounts to putting new information on the screen — and see what is there. The computer's electronics translate the numbers in these locations into what will appear on the TV screen.

Now, there are two ways in which this can be done. If you have a ZX-81, for instance, you will find that the screen RAM — often called the Display File — contains the Codes of the characters which are to be put on the screen. It does not hold information about each and every dot — or pixel — on the screen.

This may be called a character-mapped screen. Before printing a character the computer needs to consult a section of ROM known as the character generator, which stores the dot patterns for each character.

On the other hand, owners of machines such as the Spectrum, Dragon or BBC Micros will find that the Display File holds information about the rows in each character — the bytes on the screen, where there are eight bytes to a character and every byte is eight dots — or pixels — wide. This is sometimes referred to as a bit-mapped screen since each pixel on the screen is assigned to a bit in memory.

If your computer's screen is truly memory-mapped this will mean that there is a set, unmoveable area of memory put aside by the micro. In the case of a character-mapped screen about 700 locations are reserved, and for a bit- or pixel-mapped screen the area will be at least eight times as large.

The number stored in the first location in the screen RAM usually determines what will appear in the top left-hand corner of the screen, the second location relates to the second position on the screen, and so on. In some cases the screen may be somewhat more complicated than this — as owners of the Spectrum may have discovered.

Sometimes, however, a computer will not set aside a fixed area but will instead keep enough locations free somewhere within its RAM — with a pointer to the start of this area being kept in a known place. In othr cases, and Camputers' Lynx is one example, the screen's memory may be quite separate from the RAM which is available to the programmer. In such cases the Display File may be in separate memory chips which cannot easily be read from or written to.

Lastly, some micros put aside a varying amount of memory for the screen depending on whether a text or graphics display is chosen. This may amount to your having the choice between a memory-frugal Text mode and a memory-consuming Graphics mode — the Oric 1 and Dragon 32 are just two examples here.

Tim Langdell

BEATING
PUT A REM

ONE OF THE advantages of writing your own programs, as opposed to typing other people's in, is that at least you know what the machine is meant to be doing — so debugging certainly should be easier. But it is amazing how quickly you can forget what a particular bit of code is trying to achieve.

One of the most powerful weapons in the debugger's armory turns out to be the lowly Rem statement.

This is very useful if it merely tells you what

I could do that...

Amstrong numbers are numbers that are equal to the sum of the cubes of their digits. For example, 371 is an Amstrong number since $371 = 3^3 + 7^3 + 1^3$. Write a program to output all the Armstrong numbers between 1 and 5000.

We were a month early in picking the winner of March's competition in April. Future First Byte competitions will be judged two months after they are set an closing date for entries is the last working day of the month in which the competition appears.

KEYING IN

ALL VERSIONS of Basic allow you to enter information from the keyboard with Input. When Input is reached the program waits for you to enter something before continuing. It allows you to enter several characters at the same time and edit them before Input, but has the disadvantage that you must always follow your last character with Enter, which is slow and can be a nuisance when you only need to use a single key in both games or serious programs.

The alternative way of getting information from the keyboard, which is found in many Basic dialects, is the Inkey$ function. This can continually scan the keyboard and tell you instantly when a key is pressed. Inkey$ is also particularly useful in high-resolution graphics modes as it does not send you striaght back to the normal text screen as Input does. As the program does not automatically stop and wait for you to do something a loop must be made around Inkey$ which is only left when a key is pressed:

```
10 A$=INKEY$
20 IF A$="" THEN 10
```

Note that Inkey$ always gives you a String variable, and that the sign for an empty string is double quotes and a full stop.

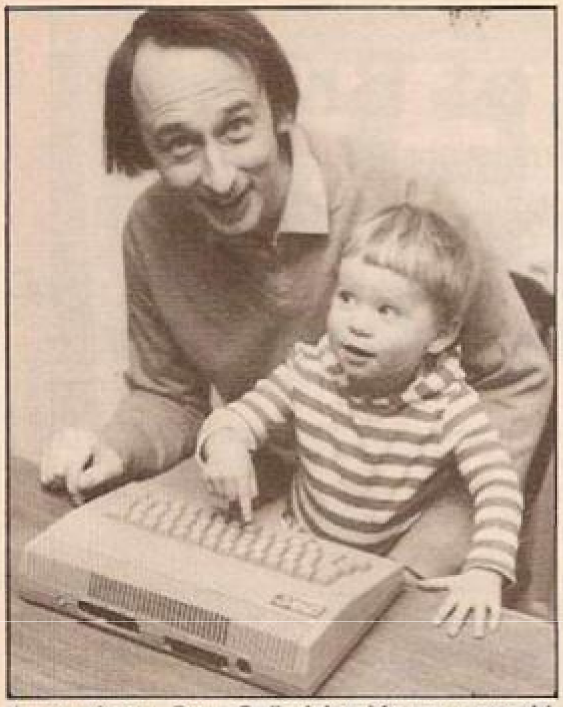
If you want to enter a number and use it for calculations then you must convert the string into a numeric variable with the Val function:

```
30 A=VAL(A$)
```

If you want to use cursor keys to continuously control left and right movement you can convert the Inkey$ string to its ASCII value — 8 for left and 9 for right — and then simply add on the left and right movements to the current position:

```
30 A=ASC(A$)
   (or A=CODE(A$) on Sinclair)
40 POSITION=POSITION + ((A=8)-(A=9))
```

Keith and Steven Brain



Lynx winner, Dave Bull giving his two-year-old son early keyboard experience. Competition details on page 183.

Relational and logical operators may sound awesome, but a computer would be lost without them. Here we explain them as simply as possible.

ALL ABOUT OPERATORS

A COMPUTER CAN only tell the difference between off and on. Sitting on the fence is not possible. It is therefore totally logical in the way it makes decisions, although of course it can only decide between options which you have decided to include in your program. All decisions are based on testing whether a particular condition — or test — is True or False. Many decisions can be made using only the simple relational operators:

=	equal to
>	greater than
<	less than
<>	not equal to
>=	greater than or equal to
<=	less than or equal to

Both numbers and strings can be compared, but with strings you must make sure that there are no invisible spaces hiding at the end of words. If you test whether

"FIRST " = "FIRST"

then the answer will be no, and similarly "BYTES" is not the same as "bytes". The last two relations are not absolutely necessary, particularly when dealing with numbers, as it is often as easy to write a program which does not need them.

```
10 IF A >= B .......
```

is equivalent to:

```
10 IF A > (B-1) .......
```

Comparisons of conditions may be made more exhaustive — not to say exhausting — by including the logical operators And, Or and Not which combine several tests together in a single program line but can become rather mind-bending.

The first logical operator, And, should be easy enough to understand,

IF test 1 AND test 2 TRUE then whole test TRUE

If both test 1 and test 2 are true then whole test is true but if either test 1 or test 2 is false the whole test is false:

```
10 IF TEMP = 0 AND DAY = 7 THEN
   STAY IN BED
```

and Or is not too bad either,

IF test 1 OR test 2 TRUE then whole test TRUE

that is, if either test 1 or test 2 is true the whole test is true:

```
10 IF MONEY = 0 OR SHOP = SHUT
   THEN HARD LUCK
```

but Not often causes chaos as it looks at first sight as if it works backwards.

IF NOT test 1 FALSE then whole test TRUE

If test 1 fails then the whole test is True: although the sense of the logic can be seen if you consider:

```
10 IF NOT (DAY=PAYDAY) THEN NO
   MONEY
```

Keith and Steven Brain

THE BUGS
⁄\ STATEMENT IN IT

each bit of the program is doing. For instance:

```
REM PLOT VALUE
```

or

```
REM ASK NEXT QUESTION
```

Many errors show up immediately you read through the program, because what the Rem say and what the code is obviously doing are quite clearly different.

Rems are also very useful for keeping track of what you are using your variables for. It is a good idea to set aside the first 100 line numbers of each program for Rems, mainly to describe variables. Each time you add a new variable, go back and write a Rem saying what it is for:

```
40 REM H IS HEAD POSITION
50 REM T IS TAIL POSITION
```

A good way of developing your own bug-free programs is to keep running a program as you type it in. Apart from making the whole process more interesting, most errors are thrown up very soon after you have typed in the lines causing the problem, so it is easier to sort things out.

Another way of developing programs which makes tracking down errors easier is to make use of "stubs". This approach lets you sort out the main point of the program first, and the fiddly bits are sorted out later. A stub is a subroutine which does the fiddly bit in a provisional, simple way.

For instance, if each time an object hits the side of the screen you want to make an elaborate noise, you can put in a Rem

```
REM GO AND MAKE ELABORATE NOISE
```

at the appropriate point in your program. Under the remark you put a Gosub instruction off to a high line number, and at that line number you put a very simple routine which merely makes a feeble beep and then Returns.

When you run the program you will know that the noise is occurring in the right place, and you can give your full attention to sorting out the rest of the program.

It makes sense to put all your subroutines together, separately from the rest of the program flow, perhaps at the end of the program, with very high line numbers, say over 10,000. With some machines it is better to put them at the beginning, especially if the subroutines are used often, because the Basic interpreter may take longer to find line numbers towards the end of the program.

With subroutines it is especially important to include plenty of Rems, as you may be calling a particular routine from several different points in your program.

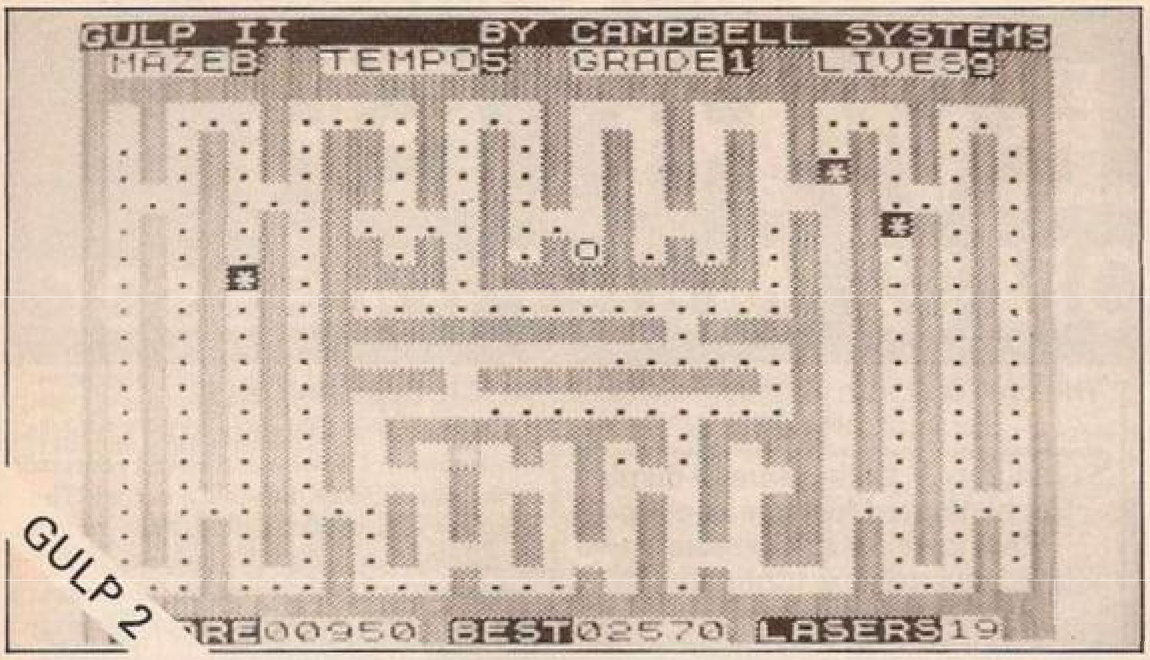
If you are adding lines to a program to help you write it which you intend taking out later — either Remarks, or perhaps Print statements — it is important to be able to get them out without introducing new errors. A very common error message is

UNDEFINED STATEMENT IN LINE n

which is caused by branching to a non-existent line. Sinclair Basic is unusual in that it lets you get away with this, assuming you mean the next highest line number.

To help me keep track of lines I might want to get rid of, I give them odd line numbers. Usually I use only even line numbers, and go up in increments of ten. So if I see a line 51 in my listing I am automatically suspicious about it once I have finished testing a program.

With Rems it is also easy to put recognisable characters in the line, for instance a string of asterisks, so you can find the lines you want to pull out easily later. Remarks do not have to be on a line of their own, and can be used after a colon to flag other testing lines. *Ian Stobie*



GULP 2

SURVEY

All systems are go as Peter Connor explores the weird and wonderful lengths to which software houses go to create programs for the ZX-81.

It is not easy to review software for the ZX-81 without using the weary old disclaimer "Given the limitations of the machine . . .", and I am not going to try. These limitations, as every owner must be well aware, are the primitive graphics and the absence of sound or colour. The limitations, of course, are far outweighed by the advantages; at about £50 the ZX-81 made home computing available to practically anyone who wanted it. After all, £50 is only 50 packets of cigarettes, or for younger readers about 350 Mars Bars.

To produce a version of Scramble, then, for the ZX-81 might seem as hopeless as trying to paint the Forth Bridge with a toothbrush. Yet it works surprisingly well. In Mikro-Gen's version all the usual features are there: the rugged terrain, guns, missiles and smart bombs, the different defence zones. If your gun seems to fire more like a peashooter than a Mig-21 you must remember that, given the limitations of the machine, this game is pretty good value.

Another old favourite produced for the ZX-81 is Invaders. Silversoft's and Bug-Byte's versions are, understandably, very similar. Both have different skill levels and the rather chunky aliens come fast and furious at the highest level. At the lowest level the games have a strange slow-motion effect, as if the invaders were on tranquillisers.

One thing games on the ZX-81 bring home to you is the magical and often hostile properties of letters. In Mikro-Gen's Tempest, a clever variant of Scramble, you have to survive as long as possible against the alien Spinners, Liners, Walkers and Asteroids. These aliens are none other than wandering letters and symbols; it is rather like being under attack from a psychotic typewriter keyboard. The Walkers — Ws — wander all over the screen while the Asteroids — formerly friendly asterisks — come straight at you. More dangerous than either of these are the Untouchables, one of whom bears a remarkable resemblance to the space bar. If you do not use your smart bombs, they will crush you. The game is in five sectors, through which the aliens increase in speed. The pleasing thing about Tempest is that Mikro-Gen have made necessity the mother of invention and used the ZX-81's simplicity to create a game of almost surreal charm.

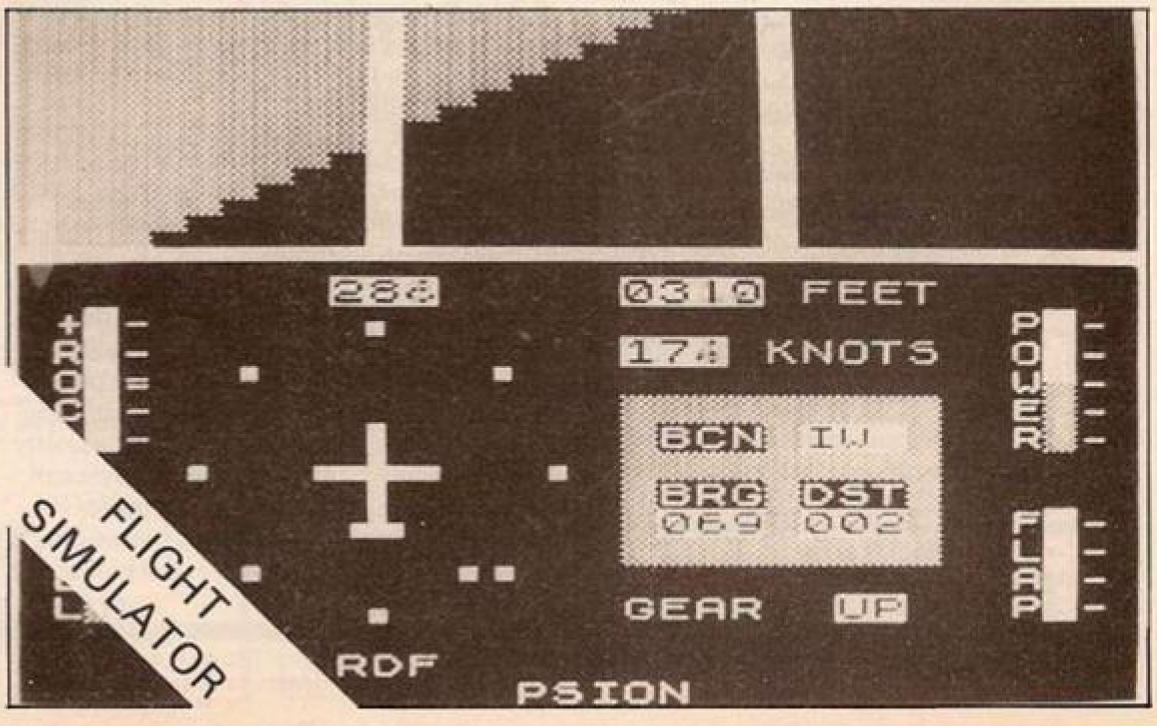
Galaxians from Quicksilva has something of the same interest. Here, the first wave of swooping aliens consists of flying Vs. But if you think those are dangerous, you'd better look out for those Ws lurking at the top of the screen. W is a genuinely nasty letter. Given the limitations et cetera, et cetera, Galaxians is a good version of the standard game. It is fast and if you miss the sound effects you could always make them yourself.

Several other arcade favourites are now available for the ZX-81. DJL Software has produced Frogger and Psion has the same game as Frogs. Both are good versions, with the logs really rolling at the highest levels. DJL's version, though, has the slight edge; as the game progresses you encounter the additional hazards of snakes and alligators. There is also the extra task of rescuing cute baby frogs from the logs on your way across. It is heartening to see software houses encouraging a sense of civil responsibility.

Personal Software Services — PSS — has a Krazy Kong game on the market. You have to climb a pyramid and knock out Kong's support. Obstacles to succeeding are barrels and fireballs which you must jump over on your way to Kong at the top. The graphics are good and make Kong a lively and exciting game.

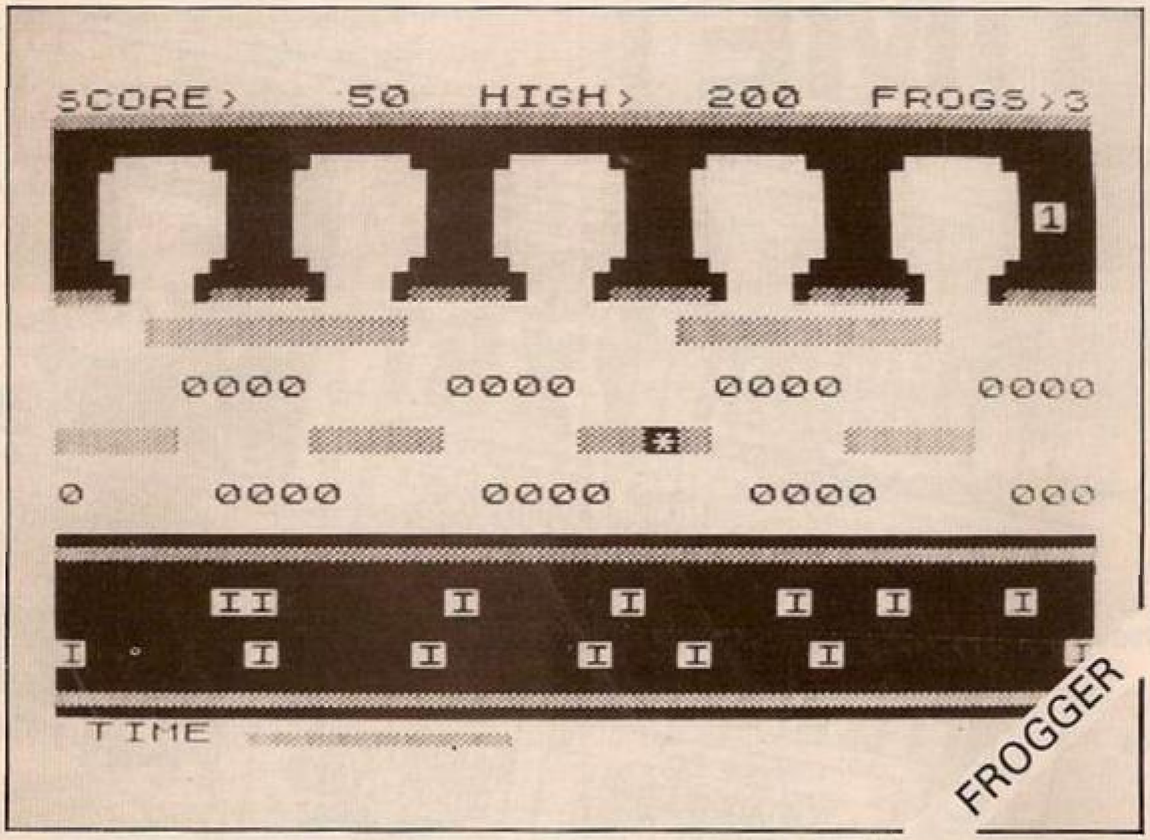
What seems to be the only version of Centipede for the ZX-81 has been produced by Llamasoft. This is a very distant relation of the Arcade game. Rather than threading its way through a forest of toadstools the centipede is unimpeded and descends too quickly.

Two games which are deservedly best-sellers are Gulp 2 from Campbell Systems and Flight Simulation from Psion. Gulp 2 is similar in quality to the version available for the Spectrum, which means it is very good indeed. It is similar to Pac-Man in that your man has to eat the dots in the maze while being pursued by hostile monsters. What is impressive, though, is that there is a choice of fifteen different mazes; you can even have one in the shape of the letters ZX-81. The speed can be set, there is a choice of two keying systems, and the game will give you a demonstration before you begin. It is not hard



FLIGHT SIMULATOR

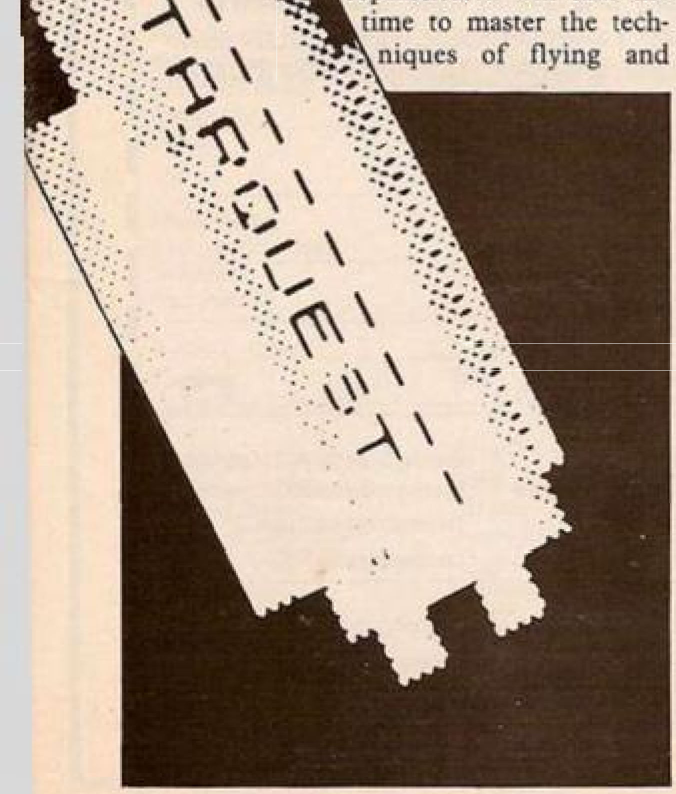
ZX-81 SOFTWARE



to see why this game has proved so popular.

Flight Simulation is just what the name says — a realistic and complicated simulation of flying. You have to direct your plane to the airport and then land it. There are two separate displays. The first is a cockpit with a view of the horizon and control panel. The second is a map showing your position relative to the landing strip, which enables you to navigate.

It takes quite some time to master the technique of landing since you have to co-ordinate height and speed then bank and dive to your death watching the horizon sway sickeningly through the cockpit windows. The more sophisticated will take the time to master the techniques of flying and landing, perhaps so that they can take over when the pilots of their Boeing 707 die from food poisoning.



But software does not have to be as complex as this to be enjoyable. Psion also markets a version of Breakout called Thro' the Wall — on the same tape as their Scramble. It is just as you would expect; a bat, a ball and a wall of bricks. The simple pleasures of this game take one back to the days when a computer ping-pong machine was as awe-inspiring as the first sunrise. The uncomplicated principles of games such as Breakout might guarantee their existence in an age of ever more noisy and baroque programs.

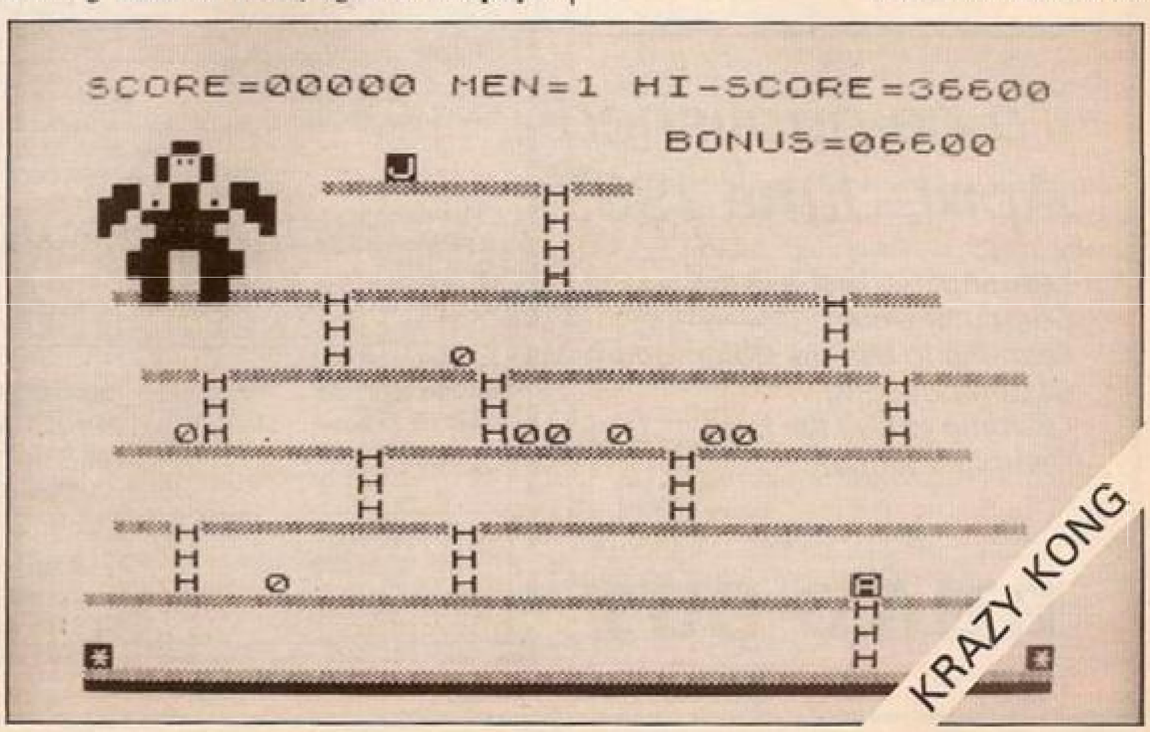
Amba Software has two similarly straightforward games; Trap and Hunt. In the first you play an opponent, or the computer, and have to block off areas of the screen by drawing lines. In Hunt, again a two-player game, you chase numbers in a maze; as time runs out the value becomes smaller. There is something compulsive about Hunt, involving as it does, the race against time and avoiding obstacles.

Adventure games are one field where the ZX-81 does not lose much by comparison with more powerful machines. This does not mean that games for the ZX-81 are different or better; on the whole we get a tepid goulash of the same leftovers. Fantasy games from Psion offer two adventures, Perilous Swamp and Sorcerer's Island. The deep stagnant pools of the first sum up the whole world of the adventure game. The princess, the evil wizard, the slimy green bunyip, the horrible dirty troll; love them or hate them, you cannot play an adventure game without them.

At least, it seemed you could not. Dictator, from Bug-Byte, looked like a welcome exception. Here, you are President for life of the banana republic of Ritimba. In this somewhat amoral game you have to exploit the country for your own good and then make your escape before the guerillas, or other opponents, get you. However, the colourful blurb and drawings flatter only to deceive. When you settle down to be a ruthless and evil megalomaniac you will be disappointed by the dullness of the game itself. Quicksilva, though, has succeeded in finding something different. Trader — in three parts — is more of a semi-adventure game; there are the usual decisions to be made, but also tasks such as piloting your ship or finding your way through a maze.

The variety of activities and the clever graphics make this much more entertaining than the usual adventure. Your objective, of course, is to make a huge profit by trading with the inhabitants of the Meridien system, all of whom have different needs and characteristics. The Psions are immensely intelligent beings, constantly rearranging the blobs which constitute their bodies. They are con-

(continued on page 45)



A NEW SERIES FOR FIRST TIME USERS



"Learning to Use" is a new series of books which introduces newcomers to the most widely used micros in the marketplace.

The books assume absolutely no knowledge about computers and the reader is shown even the most fundamental operations such as "switching on" and "loading a program". The books lead the reader through simple programming and then on to graphics, with several programs which show how to achieve pictures and even animation!

The user-friendly approach is consistent throughout the text – not only are program listings clearly shown, but in many cases, a photograph is included to show what the program looks like when actually loaded and run!

All books in the series are £5.95 (incl. postage).

Gower

To be published April–June 1983

Learning to Use the Oric 1 Computer (April)
Learning to Use the Commodore 64 Computer (May)
Learning to Use the Lynx Computer (June)

READ-OUT

YC5B

Order Form to: READ-OUT BOOKS AND SOFTWARE

8 CAMP ROAD, FARNBOROUGH, HANTS, GU24 6EW.
24 Hour Answering Service. Telephone 0252 510331/2

Name ____________________

Address ____________________

Make cheques payable to Newtech Publishing Ltd — I enclose my cheque for £ ________

Please debit my Access ☐ — Signed ________

Number ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ — Date ________

NOW AVAILABLE
Please send me ....copy/ies all at £5.95 each
incl. postage & packing. (Allow 14 days for delivery.)

- ☐ Learning to Use the PET Computer
- ☐ Learning to Use the BBC Microcomputer
- ☐ Learning to Use the ZX Spectrum
- ☐ Learning to Use the Apple II / IIE
- ☐ Learning to Use the VIC-20 Computer
- ☐ Learning to Use the ZX81 Computer
- ☐ Learning to Use the Dragon 32
- ☐ Learning to Use the TI 99/4a

To be published
Please reserve for me, and send to me on publication my copy/ies of all at £5.95 each (incl. post & packing)

- ☐ Learning to Use the Oric 1
- ☐ Learning to Use the Commodore 64
- ☐ Learning to Use the Lynx

(continued from page 43)

temptuous of human intelligence and, before doing business with them, you will have to answer their questions correctly. With Betans you must bargain. With the robotic Alphans you can only take it or leave it. On Delta though, you can make a killing.

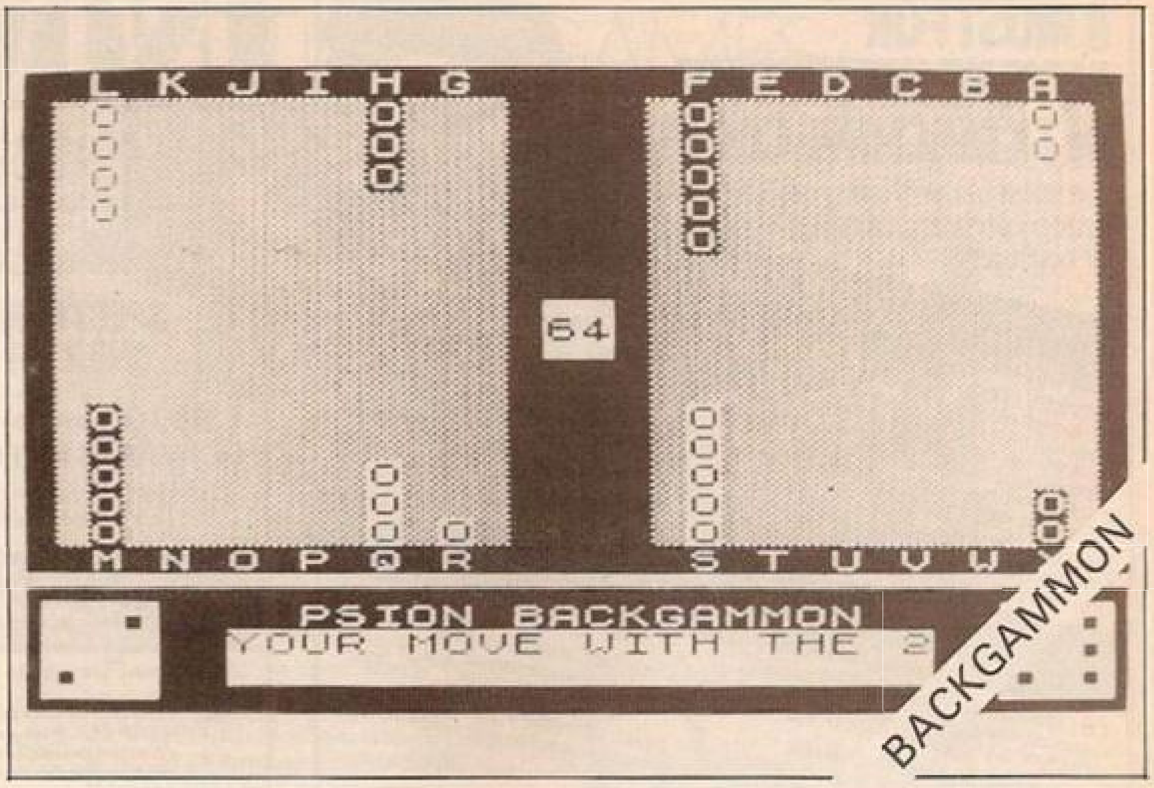
These junkies will pay an enormous price for your Boosterspice, a kind of inter-galactic heroin. But you have to be careful they do not mug you or your might pass out of the Meridien system, as I did, in a sordid back alley. Trader is great fun — do not be put off by the unnecessary packaging and silly booklet.

Traditional board games are also in evidence in ZX-81 software. Psion has both chess and backgammon tapes. Of the two programs backgammon is the more satisfying, since it suffers less from the graphics limitations of the ZX-81. By playing the computer you can teach yourself how to play the game. The display is clear and wrong moves are explained. Chess, on the other hand, is rather confusing; as the program notes suggest, it is a good idea to set up the game on a normal board. Another drawback is that moves are entered using algebraic notation — for example, E2-E4, but the board on the screen has no letters or numbers. If you are not familiar with the system it can take you some time to figure out what to enter. The computer's response is quick at levels 1 and 2, but on level 3 can take several minutes. At the two lower levels it plays a reasonable, though not very strong, game of computer chess.

Better value

Generally, those programs that have some practical application are better value than the games software and, to my mind, more interesting. Games, after all, are not the ZX-81's forte; most people buy the machine primarily as an introduction to computing rather than as a games machine.

In particular, probably more people have gained some familiarity with machine code on the ZX-81 than on any other home micro. Few Vic owners for example know where or how to insert machine-code routines; every dedicated ZX-81 owner, by contrast, has learned the value of a hex loader or the significance of the figure 16514.



An assembler, of course, removes the hassle of hex loading. Bug-Byte's ZXAS allows you to enter standard Z-80 mnemonics in Rem statements and also accepts labels for jump and call instructions. It takes up 5K and will assemble code at any specified location.

Assemblers are indispensable to the serious machine-code programmer and Bug-Byte's is as effective as any other available. To go with it the well-equipped programmer also needs a machine-code monitor. Two on offer are from Picturesque and Crystal Computing. These are both well-written and useful programs although the Crystal Computing monitor is perhaps the superior version. In addition to providing a range of facilities for entering, displaying, moving and testing machine code, it also supplies a disassembler and the option for saving and loading blocks of memory in any part of RAM.

Picturesque's Screen Kit 1 contains a varied selection of machine-code routines which are embedded in Rem statements and can be used from Basic programs. These include routines for scrolling in any direction, saving and loading variables, and displaying the amount of memory left. Most of these routines have already been published in home computer magazines — or, at least, in *Your Computer* — but the collection could be recommended to newcomers.

Rather more useful is Bug-Byte's ZXTK toolkit. Again this is a suite of Rem-based routines but specifically intended as aids to program development. There are ten options which offer such features as renumbering and deleting of Basic program lines as well as facilities for moving and merging programs whenever you want.

Question of ease

There is not much to choose between the two programs. The Fast One leaves around 11,700 bytes free for file space and offers a greater range of features — including an option for finding the total and average of figures within selected records. Vu-File on the other hand has slightly less file space but is easier to use.

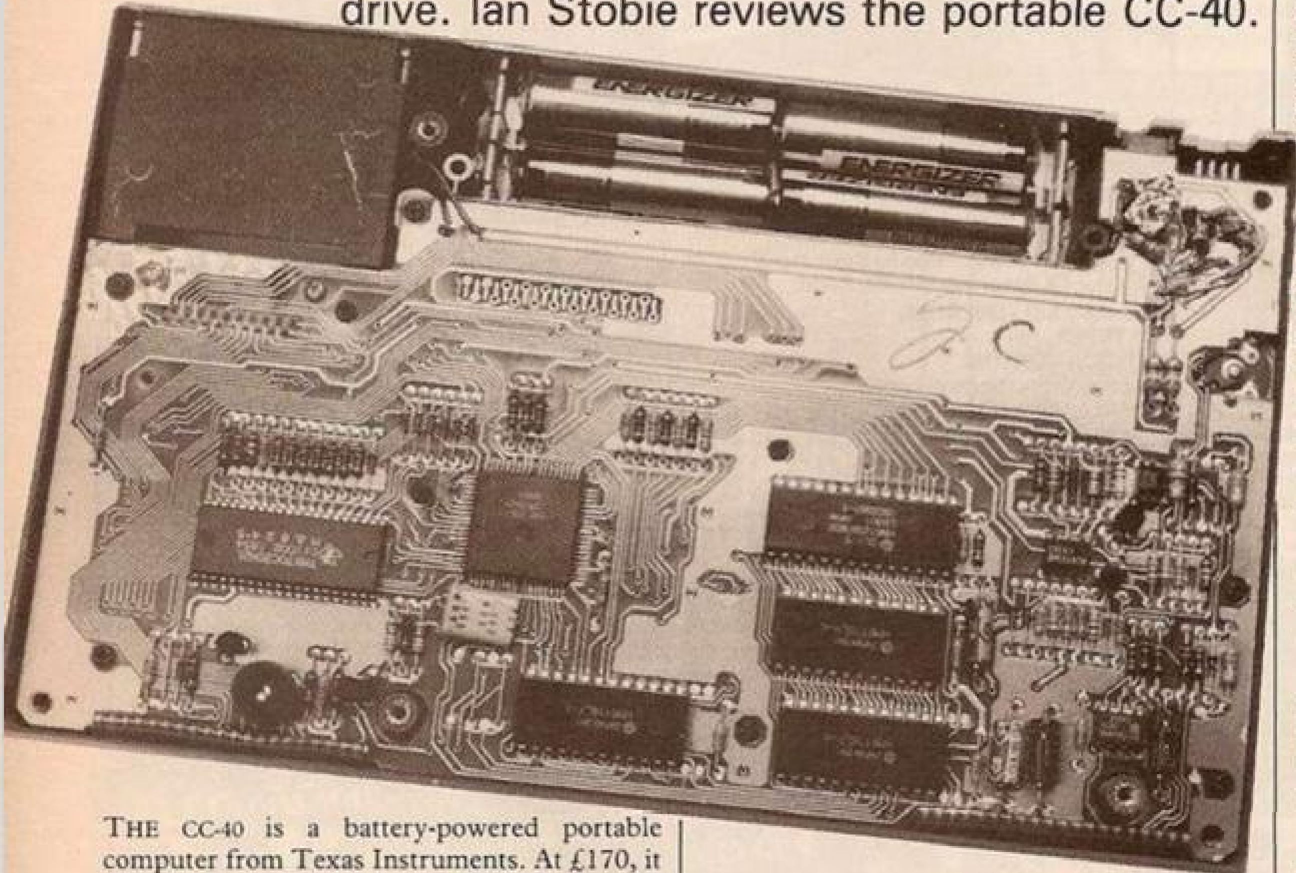
None of these facilities would be exceptional if they were present on a larger micro; but on the ZX-81 the speed and versatility of these programs is quite an achievement — given the limitations . . .

The final word in this review, sadly, must be a critical one. Many of the programs discussed were loaded only after repeated attempts. Some programs could not be reviewed because they obstinately and persistently refused to be loaded, even when tried on different recorders. One of these brutes was, unfortunately, Gauntlett — a game I would have liked to play as it features in *Your Computer's* Top Twenty. An honourable mention has to be made here of Psion, whose programs all loaded first time. While conceding that the ZX-81 is a sensitive beast which must be approached with caution, I do not see why manufacturers cannot take a little more care with their products and help the consumer to avoid the frustration and rage which are the result of faulty loading. ■

Company	*Software*	*Price*	*Company*	*Software*	*Price*
Psion,	Chess	£6.95	Crystal Computing,	Monitor	£8.95
Sinclair Research,	Flight Simulation	£7.95	2 Ashton Way,		
Stanhope Road,	Backgammon	£5.95	East Herrington,		
Camberley,	Thro' The Wall	£4.95	Sunderland SR3 3RX.		
Surrey.	Fantasy Games	£5.95			
	Vu-File	£7.95	Picturesque,	Screen Kit 1	£5.70
			6 Corkscrew Hill,	ZX-MC	£7.50
Mikro-Gen,	Tempest	£3.95	West Wickham,		
24 Agar Crescent,	Scramble	£3.95	Kent BR4 9BB.		
Bracknell,	Frogs	£3.95			
Berkshire.			DJL Software,	Frogger	£5.95
			9 Tweed Close,		
Amba Software,	Hunt	£4.95	Swindon,		
Freepost,	Trap	£4.95	Wiltshire.		
Cambridge CB3 7BR.					
			PSS,	MCoder	£7.95
Bug-Byte,	ZXTK	£6.00	452 Stoney Stanton Road,	Krazy Kong	£7.95
100 The Albany,	ZXAS	£5.00	Coventry CV6 5DG.		
Old Hall Street,	Dictator	£9.00			
Liverpool L3 3AB.	Invaders	£4.00	Silversoft,	Invaders	£3.95
			20 Orange Street,		
Quicksilva,	Galaxians	£4.95	London WC2.		
92 Northam Road,	Trader	£9.95			
Southampton SO2 0PB.			Llamasoft,	Centipede	£2.45
			49 Mount Pleasant,		
Campbell Systems,	Gulp 2	£4.75	Tadley,		
15 Rows Road,	The Fast One	£12.00	Basingstoke,		
Buckhurst Hill,			Hampshire.		
Essex IG9 6BL.					

TEXAS

Compact Computer is the first of a new wave of micros from Texas which have been designed to use a range of miniaturised peripherals including a stringy-floppy tape drive. Ian Stobie reviews the portable CC-40.



THE CC-40 is a battery-powered portable computer from Texas Instruments. At £170, it is in the same price range as the Dragon and the 48K Spectrums and Orics — but that is its only similarity. The Compact Computer will never know the satisfaction of crushing a human at space invaders; it is a machine with a serious purpose.

Up until now Texas has taken care of the home market to its own satisfaction with the TI-99/4A. The Compact Computer 40 is an attempt to get into the booming portable market, currently dominated by names like Epson, NewBrain, Casio and Sharp.

The CC-40 weighs a little more than one pound and measures 9.25in. wide by 5.75in. high by 1in. thick — about the size of a big paperback. It can run for 200 hours on four AA size alkaline batteries and it has a built-in 31-character single-line liquid crystal display and good-quality calculator-style keys in a QWERTY layout.

Cartridge slot

Inside, the CC-40 is built around a Texas own-brand eight-bit CMOS chip, the 70C20. It comes with 34K of ROM containing a comprehensive Basic, and 6K of RAM extendable to 18K internally. A cover at the top edge of the machine to the right of the display pulls off to reveal a memory cartridge slot, and a further 16K of RAM can be fitted here, giving an absolute maximum of 34K RAM. Program cartridges also fit into this slot.

Texas expects great things for the new peripherals designed for the CC-40. These include a battery-powered four-colour printer/plotter of the Sharp type, a fast "Wafertape" continuous loop cassette drive like Sinclair's Microdrive, and an RS-232 interface unit for connecting up to big printers and, potentially, other computers.

A Modem and a black and white TV interface are also scheduled for release later in the year. The CC-40 system is clearly aimed at people using computers for their work; but this could include students of scientific or engineering subjects as well as professional users.

The whole machine is well made. For instance, along the bottom of the machine runs a recessed stand, which can be pulled down to tilt the keyboard to a nice angle for typing. There will be no need for entrepreneurs to offer adaptor feet at £4 a pair.

The casing itself is made from a silvery-grey plastic, except for the numeric keypad, a few of the other keys and the area around the screen, which are highlighted in a darker grey.

At the back of the machine is a slot for the optional AC adaptor which costs £14.95, and the Hex-bus connector, into which all the peripherals will fit.

There were no problems with the keyboard. The calculator-like keys feel comfortable and give tactile feedback. The layout is fairly close to the standard QWERTY pattern, but the Enter key, the Texas equivalent of Return, is rather annoyingly positioned where you might expect the right-hand shift key to be.

Given the size of the CC-40 the keys are obviously smaller than on a standard typewriter, but they are easy to use and larger than on the Sharp PC-1500 for instance, a machine with virtually the same price and an obvious competitor.

The CC-40 comes with a plastic keyboard overlay, which among other things has the principal Basic keywords on it. Basic keywords can either be typed in full in the normal way, or by using the function key then hitting the appropriate single key given on the overlay, the machine can be made to produce them Sinclair-style on the display. This is a useful time-saving feature, although the overlay itself might soon be lost.

Program scrolling

The display is a single line of 31 characters, but this can be used as a window on to an 80-character line. The arrow keys above the keypad can be used to scroll around horizontally within the line, or to step vertically within through a program listing. With a little practice the small display does not seem such a limitation, although for developing long programs the printer at £149.95, would be essential.

On the side of the machine to the left of the display is a knurled wheel. Turning this adjusts the display angle electronically, so you can aim it at yourself to get the best contrast.

The characters are formed on a five-by-eight matrix, and like all LCD displays are much less tiring to watch than a TV screen. The lack of colour confirms that this is a working machine, rather than an entertainment device.

On both sides of the actual text line in the display one finds indicators showing battery-low warnings, upper-case lock on, Function, and which units the trigonometric functions are currently returning value in.

The machine can be used as a calculator. It works exactly the same as Basic in immediate mode, but on the CC-40 it is not necessary to type Print before a calculation. You just key in 8*63 and then hit Enter, and it gives you the answer.

The up-arrow key, used with Control held down, functions as a playback key. Hitting it brings back the last line entered on to the display, where it can be edited, and the calculations redone. This saves time if you have entered a long complex calculation and want to try it out with a few different values.

For anything more complex there is Basic, and the CC-40 has a very full Basic. Again, it is practically oriented. There are no sound commands to support the small internal beeper, only the feeble Beep, but this is sufficient for attracting attention.

The numeric precision is good — 10 displayed significant digits — but the machine is not very fast. Battery-powered CMOS machines are inherently slow.

If your foreign languages need brushing up try,

```
Call Setlang 1
```

This puts out all the error messages in German — *Variable nicht definiert* — and that kind of thing. Other languages are available on ROM cartridges.

The Basic has all the usual commands of

CC-40 REVIEW



CONCLUSIONS

- The CC-40 is a well-made, battery-powered portable machine intended mainly for serious use. It will be good for field-work, travel, and as a sophisticated calculator replacement.
- The machine has no colour capability, and compared to a home-based micro limited maximum memory and a slow processor speed. It is not a games machine.
- The CC-40 is aimed at professional and technical users. It has a full and powerful Basic.
- Its main rivals will be the Sharp PC-1500, and perhaps even the luxury £700 Hewlett-Packard HP-75C.
- For serious users the range of mostly battery-powered peripherals will make the machine very attractive. The CC-40 really comes into its own as the central unit in a system.

Microsoft-style Basic. It includes If . . . Then . . . Else, On . . . Goto/Gosub/Error, Print Using to format output conveniently, and various file control commands for use with the Wafertape, like Open, Print#, Input#, and Verify. Three-dimensional arrays are allowed, and long variable names.

Strings can be up to 255 characters long. String handling works differently to most home micros. Instead of Left$, Mid$, Right$ the CC-40 has a Seg$ command for extracting substrings, and a Pos command to find them.

Another addition is the way subroutines are handled. Gosub is there and can be used in the normal way, but there are several more powerful commands allowing you to set up sub-programs. These are called with a Call statement and an optional set of parameters.

The 34K ROM contains a number of useful sub-programs. Call Debug gets you into a machine-code monitor, with all the usual Examine, Move, Copy and start Executing commands, plus the ability to set Breakpoints.

The CC-40 manual which describes all this is extremely good. It is a 300-page professional manual, not just a home micro manual.

Ready-written software will be available on cartridges and Wafertapes. Statistics, Finance, Maths and Electronics cartridges should be available immediately, with Perspective drawing, business graphics and a few others hot on their heels according to Texas. These all cost £59.95. Two games cartridges cost nearly £40, and the Assembler nearly £125, so software is not cheap.

The Wafertapes will be cheaper, just under £20. Again the announced titles look fairly professional — things like Elementary Dynamics, Pipe Design, Profitability Analysis. Texas hope to find third-party software suppliers to contribute additional titles. ■

Ghoulies and ghosties and long-leggety beasties and things that go bump in the night — smile please for the cameras of Captain Spectre and his Spectrum-powered Spook hunt. Meirion Jones joins the chase.

WHERE MICROS FEAR TO TREAD



Tony Cornell stands in his Cambridge basement surrounded by mementoes of previous ghost hunts. The strips of enlarged cine film behind him helped to expose Dr Richards and his allegedly haunted fish tank. Cornell's new Spectrum-based box of tricks should make it easier to expose fraud but also to obtain genuine evidence of paranormal events if they do occur.

BENEATH THE STREETS of Cambridge he waits for the call. A spear hangs from the ceiling, a sword from the wall. Any moment the red phone could ring and send Captain Spectre's Flying Squad and their electronic ghost trap out on the trail of another ghoul.

The scene sounds straight out of *The Avengers* but Captain Spectre's quarry is more elusive than any that Emma Peel or John Steed tracked down. His mission is to capture for the first time on film denizens of another world — spirits, poltergeists, ghosts. His only weapon is a 16K Spectrum linked to an array of sensors, lights, recorders and cameras.

Captain Spectre — or Tony Cornell as he would rather be known — is fully aware of the problems of capturing spirits on celluloid. As Treasurer of the Society for Psychical Research he has been able to leaf through the thousands of supposed ghost photographs sent to the SPR since it was set up a century ago to investigate paranormal phenomena. He believes that there is "not one photograph in the archives that we would today accept as genuine."

Traditional methods of investigating haunted houses or poltergeists, are unlikely to produce scientifically acceptable results. An observer who has been left for the night in some gothic manor is quite likely to be seeing things by the early hours of the morning whether they are there or not and if anything should happen the observers may not be able to turn on recorders or take a photograph in time.

An automatic observation station with cameras and recorders that can be instantly triggered by movement, temperature changes or sound and can be left to monitor a site for days at a time is far more likely to produce useful results. It is also less likely to be taken in by the many deliberate frauds and practical jokes which have often taken in investigators of the paranormal. Sherlock Holmes's creator Sir Arthur Conan Doyle who joined the SPR after pushing his all-seeing detective off the Reichenbach Falls remained convinced to the end of his life by a film purporting to show fairies dancing at the bottom of his garden. Last month — 60 years later — one of the fairies, Mrs Elsie Hill, finally admitted that it had all been a hoax.

Alan Cornell's first investigation of a poltergeist convinced him of the dangers of taking things at their face values. He had gone to an erie-looking Victorian house in North London where a mysterious crashing and banging noise in empty rooms had convinced a family that the house was haunted. The father, mother and three children had all moved out leaving only Grandad who refused to be scared off. On the evening that Cornell called in the old man was sitting in a corner by the fireplace. Cornell sat down and shortly afterwards he heard "thumps and bumps and crashes and bangs upstairs". A check of the upstairs room yielded no clues — there was nobody else in the house apart from the old man downstairs in his armchair. When the noise started again Cornell noticed out of the corner of his eye that Grandad was moving his shoulder.

"He had connected up two wooden balls and a heavy piece of lead under the floorboards upstairs to the old Victorian bell pull which had been used to call the servants". I asked him why he had pretended that the house was haunted. He said he had lived in the house for years and now he was old his family were planning to send him to an old people's home. It was a question of either they went or he went."

That was 25 years ago and Cornell has exposed many other frauds since — and not only in Britain. One of the strangest cases was a Dr Richards in America who claimed that inanimate objects in his fish tank were moving of their own volition and that he had film to prove it. At first glance his film was impressive but Cornell was able to duplicate the effect using standard animation techniques — shooting the film frame by frame and then moving the objects very slightly in between shots.

Dr Richards then claimed that if a question



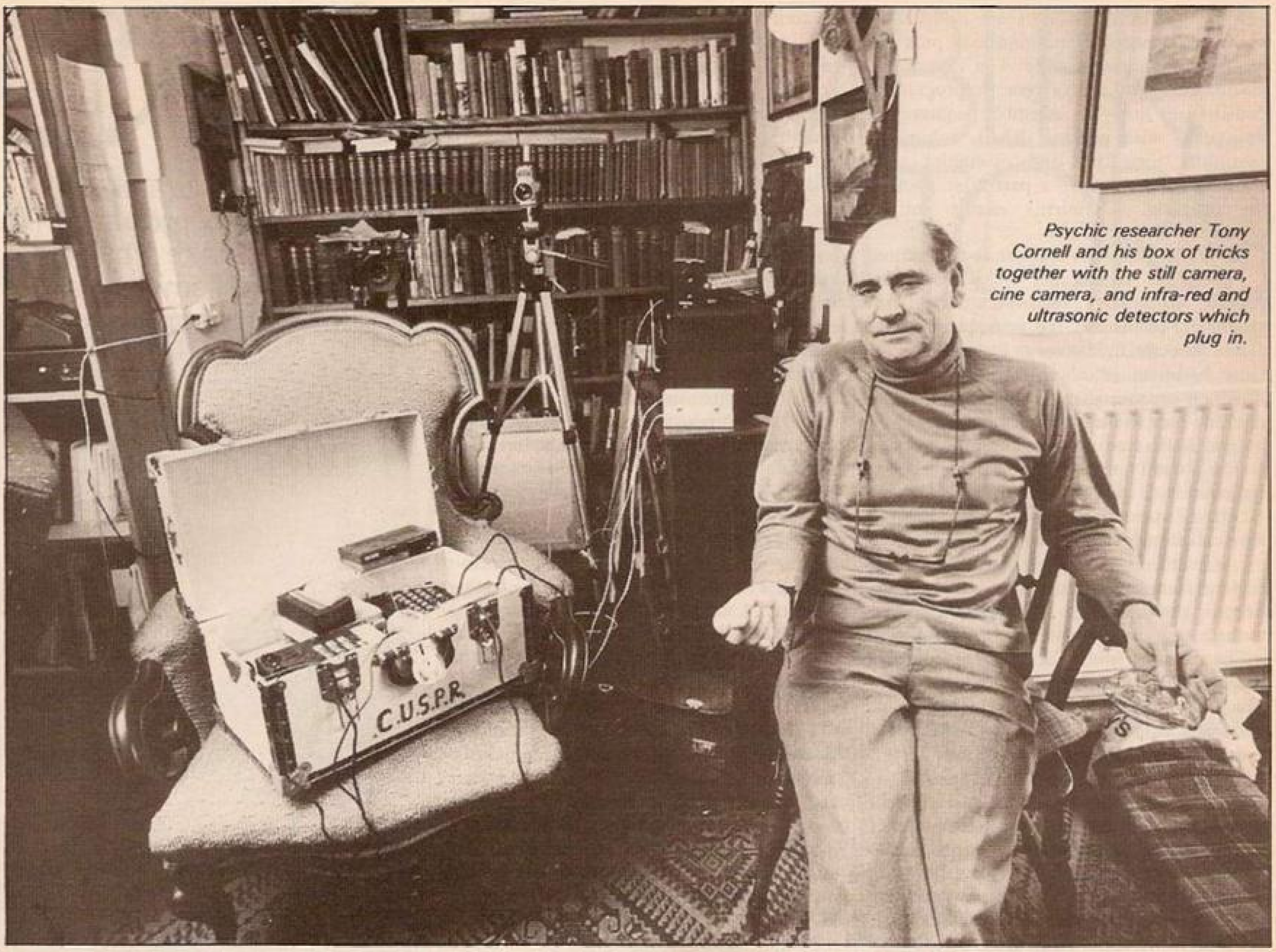
in a self-addressed envelope was placed in the tank the spirits would answer it and return it through the U.S. mail. Using rubber gloves Cornell carefully prepared his question sheet and sent it to Dr Richards. Sure enough the answer came back through the post but when fingerprint powder was dusted over the sheet it revealed that Dr Richards' spirits had human finger and palm prints.

Although Cornell soon realised that automatic continuous surveillance equipment would make psychic research much easier, until recently the cost of such a system would have been prohibitive. Cheap home computers changed all that. The box of tricks at the heart of Cornell's monitoring system contains a 16K Spectrum, a Sinclair printer, a DCP Interspec, and a series of relays. An array of sensors can be connected up to the box. These include two infra-red beams and a doppler-shift ultrasonic alarm to detect movement, circuit breakers to detect small movements, and sensors which can be triggered by noise or sudden changes in temperature.

The Spectrum is programmed to monitor all these inputs and to respond. If a sensor is triggered the Spectrum turns on lights and runs a cine camera for 20 seconds. It also turns on a tape recorder for one minute and takes six still photographs with a motor-driven camera. The program also helps set up the equipment by checking through stage by stage with the operator that everything has been correctly connected. The Spectrum prints out a record of what responses were triggered and when. Once it has been set up the equipment can function for several days without attention.

The first test for the new box of tricks came this Christmas. A 200 year-old chest of drawers in an antiques warehouse had been at the centre of some strange happenings. For

(continued on page 53)



Psychic researcher Tony Cornell and his box of tricks together with the still camera, cine camera, and infra-red and ultrasonic detectors which plug in.

(continued from page 51)

weeks every morning when the staff came in the drawers would be hanging out at strange angles even though they had been pushed in when the staff had locked up the night before. Eventually Tony Cornell was called in. He and the Cambridge University Society for Psychical Research, CUSPR, staked out the storeroom the chest was in with their box of tricks. The response was triggered eight times but the drawers had not moved and there was nothing unusual on the film. The equipment may have been triggered by a spike in the mains current so a mains smoother has subsequently been fitted. Since then there have been no further strange happenings with the chest which now sits uncomfortably in Tony Cornell's basement with two tribal sculptures eyeing it suspiciously from across the room.

Cornell is cynical about haunted houses — he believes that ghosts may be in the eyes of the beholders once they have been told that a particular place has a spooky reputation. Once he and several members of the SPR were invited to the Ferryboat Inn in Huntingdon to witness an apparition by the White Lady who was supposed to appear every March 17. "The landlord gave us dinner, there were hundreds of sightseers, Americans everything. No-one had ever seen the White Lady — it was terrible. Some months later I saw it in a Sunday magazine described as 'The fifth most haunted house in Britain'."

Because of his own experience he is less cynical about poltergeists. At Hanneth Hall in Wisbech, Cambridgeshire, he was among a team of investigators who tore the place apart looking for any normal explanation of the bumps and thumps and objects flying around which they experienced there.

At one time it was thought that such effects might be caused by vibration perhaps from underground streams or seismic activity. Cornell's own experiments convinced him that was not the case. He obtained permission to subject four cottages which were scheduled for demolition to intense vibration. Although the tests were continued to the point when the cottages were about to collapse they were unable to duplicate the effects attributed to poltergeists.

Spectrum telepathy

Richard Loosemoore, who built Cornell's box of tricks for just over £200 — the cameras and sensors are borrowed as and when necessary — is hoping to use a 48K Spectrum for more psychic research. He is conducting research into Artificial Intelligence — in particular cognitive psychology. But his own interest is telepathy. He believes that "there is no question about the proof of telepathy — it is just a question of what the mechanism is."

In Loosemoore's experiments two volunteers sit in separate rooms and one attempts to transmit his or her emotional state — agitation, relaxation or anxiety — to the other by telepathy. Using the same principle as a lie detector the observers measure the Galvanic Skin Response — changes in skin conductivity — of both volunteers. If they really are able to transmit emotions by telepathy then the observers should be able to detect simultaneous changes in the GSRs of both volunteers.

In the past Loosemoore has had to borrow expensive purpose-built machines when he can to process and evaluate the data. The CUSPR has now given him £300 which he hopes will allow him to build a new system around a 48K Spectrum which will make it possible to carry out far more tests.

Tony Cornell has found the recent publicity for his investigations of the paranormal to be a mixed blessing. He never knows who is going to be on the other end of the line when the red phone goes. "I could be called out by two raving nutters — there is a lot of cranky stuff in this field". The shelves of Cornell's basement contain everything from Nostradamus's prophesies of doom and destruction to Eric von Daniken's tales of prehistoric spacemen.

Cornell suspects that "some as yet little known human faculty" may be responsible for psychic phenomena. His failure to catch a spirit red-handed opening the 200-year-old chest of drawers has not led him to believe that the spirits have something against being photographed. "After all" he says sounding more like a social worker than a psychic researcher "they are only doing it to draw attention to themselves." ■

SPECT

To turn those dreams of machine-code programs into living facts, take Phil Holliday's advice on assemblers and monit

ASSEMBLERS AND monitors are designed to make the process of machine-code programming as simple as possible. The input to an assembler — the source code or program — consists of lines of assembly-language instructions, with optional labels, comments, assembler directives and assembler commands. Labels identify a particular point in the program. Comments enable you to document your program.

Assembler directives are pseudo-instructions — not Z-80 mnemonics — which either provide parameters for operation of the assembler, or instruct the assembler to store values directly in memory. Commonly provided directives include Org — short for origin — which supplies the starting address of the machine code to the assembler and Equ which assigns a value to a label. DefB, DefW and DefM insert a byte, word or string respectively at the current address.

Unlike assembler directives, commands have no effect on the object code produced by the assembler but instruct the assembler to perform certain operations, such as to produce a heading in the listing, or change the address in the listing from hexadecimal to decimal.

The output from the assembler is the hexadecimal machine code — object code — which is loaded directly into memory, and optionally a listing which has the addresses and op-codes added to the source file.

The assemblers reviewed used one of two methods to enter the source code. Either the source code is entered in Rem statements in Basic, or an integral editor is supplied as part of the assembler package. Normally these editors use line numbers, just as in Basic, but with an auto-line number, renumber and block-delete facility. Since most of the time spent sitting at the keyboard is actually spent using the editor, either just entering source code, or else modifying it in the debugging phase, it is most important to have an editor which is quick and easy to work.

Finally having entered and assembled a source file, it must be run and debugged. A monitor is required for this. Some assemblers do contain a simple set of monitor commands but, in general, a more comprehensive monitor is required. In particular, commands are required which allow registers and memory to be inspected and modified, and to run the program from a given address with break-points set to terminate the run at a given address or addresses. Other necessary facilities are the ability to relocate the assembled object code — it may actually need to be run in the area occupied by the assembler for instance — and a disassembler would be required if the assembler does not produce a listing of the assembled program.

List of suppliers	Price
ACS Software, 7, Lidgett Crescent, Leeds LS8 1HN.	
Ultraviolet assembler	£7.50
Infrared disassembler	£6.75
Artic Computing, 396, James Reckitt Avenue, Hull, North Humberside.	
48K Spectrum Assembler	£9.95
Spec Bug monitor	£6.95
Bug-Byte, 100 The Albany, Old Hall Street, Liverpool L3 3AB.	
Aspect assembler	£9
CP Software, 17 Orchard Lane, Prestwood, Buckinghamshire HP16 0NN	
Spectrum assembler	£4.95
Crystal Computing, 2 Ashton Way, East Herrington, Sunderland SR3 3RX.	
Zeus assembler	£8.95
Monitor and disassembler	£8.95
Hisoft, 60 Hallam Moor, Liden, Swindon SN3 6LS.	
DevPac	£12
Picturesque, 6 Corkscrew Hill, West Wickham, Kent BR4 9BB.	
Spectrum editor-assembler	£8.50
Spectrum monitor	£7.50

In ACS Software's Ultraviolet Assembler, the Basic editor is used to enter source code into Rem statements. A dummy Rem statement, long enough to hold the assembled code, must be created as the first line of the program. The source code is then assembled by the Ultraviolet assembler and a listing is sent to the screen, with different classes of op-code being printed using different paper colours. The listing can optionally be sent to the ZX Printer. All numbers must be entered in decimal, and multiple statements can be entered in one Rem line. The Infrared disassembler is also available from ACS and produces a similar colourful output to the Ultraviolet assembler.

The Ultraviolet Assembler — from Artic Computing contains a built-in monitor and only runs on the 48K Spectrum. The source code is automatically stored in a Rem statement at line 2, and the object code is put into a Rem statement in line 1. The editor is fairly comprehensive. It does not use line numbers, like all the other products reviewed here, but has a screen editor mode in which the cursor can be moved up and down to point at lines. Lines can be inserted or deleted at the cursor position. A line-editor mode is also available allowing text to be modified.

The assembly is initiated from the built-in monitor, which also allows the assembled program to be run. Most of the normal monitor functions are included, allowing memory and registers to be inspected and modified and blocks of memory to be moved, but it does not have a breakpoint facility which is essential for debugging. Also it has no disassembler, which is vital since the assembler does not produce a listing of the assembled code.

One very useful feature of this product is a memory status report at the bottom of the screen showing how much memory is occupied by the source, object, labels and Basic program and how much is still free. The documentation is good, providing clear instructions and hints and examples to the user.

The Aspect 4.2 Editor-Assembler by Bug-Byte proved to be a very disappointing program. The editor is most unfriendly. It has an invisible cursor, which makes entering and modifying the source code very difficult indeed. Text cannot be inserted or deleted without first deleting all characters from the end of the line back to the required point. The labels can be of any length but they are cut to five characters length in the listing. The symbol table space is fixed at approximately 450 bytes, which may be very limiting in some



applications. There is no way of outputting the listing or symbol table to the printer, which makes debugging very difficult. The documentation is barely adequate.

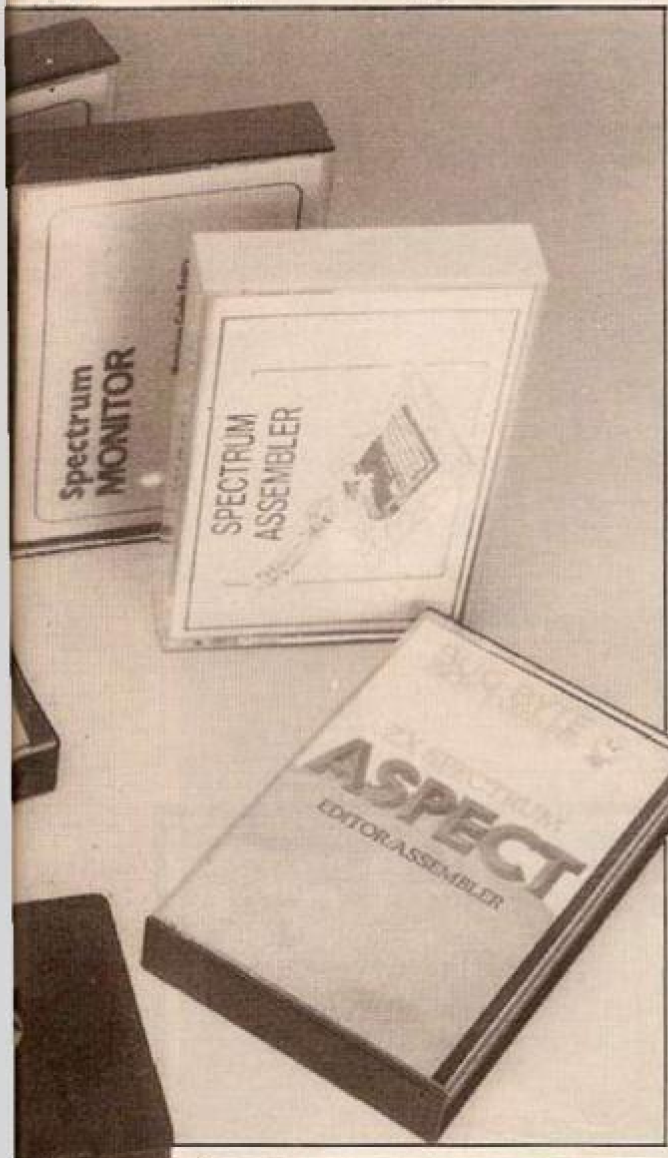
The assembler from CP Software is very limited. It is written in Basic and assembles the code at a painfully slow rate. The source code is entered into Rem statements. Labels are limited to three characters in length, and the only assembler directive provided is DefB.

The Zeus assembler from Crystal Computing is a well thought-out program. It has a true screen editor. Text may be displayed and modified by moving the cursor to the appropriate place in a line on the screen. It also has a good auto-line number, renumber and block-delete facility. This editor was easy and pleasant to use. The assembler does not produce a listing, but the source code and symbol table can be sent to the printer or screen. A built-in monitor allows the assembled object code to be run, and has other useful features.

However, a separate and more comprehen-

rs.

RUM ASSEMBLERS AND MONITORS



sive monitor is available from Crystal Computing which allows breakpoints to be set and the program to be run and disassembled. The documentation supplied is very good. The manual starts with an example of a machine-code program and the user is taken step by step through the process of editing and assembling it.

The most comprehensive product reviewed was DevPac by Hisoft. The assembler-editor — Gens — and monitor — Mons — are two separate programs but are sold as one product — DevPac. The editor is an extremely comprehensive line editor. It takes a little time to learn to drive it but it is well worth the effort. It includes auto-line number, renumber and block delete.

The line-editing commands available are too numerous to list here. Some examples are commands to delete or insert characters, delete all characters from the cursor to the end of the line, reload the edit buffer from the text and many others.

The assembler is very fast and the only one reviewed with the powerful conditional assembly feature If-Then-Else. It also allows expressions of decimal, hex, binary, character constants and labels with operators of addition, subtraction, integer multiplication and division, logical And, Or and Xor, and mod operators. There are many assembler commands available which can be inserted into the source code. It is possible to enable and disable the listing and printer, and to list the location counter in hexadecimal or decimal with the appropriate commands. Options can also be selected at assembly time, enabling the object code and listing to be turned off, and to direct the listing to the printer.

The Mons monitor provides all the usual commands one would expect. Registers and memory can be inspected and modified, and memory can be moved. It also contains a disassembler which inserts labels into the disassembled listing. The object code can be executed, and break-points set, but what sets this monitor apart from all the rest is that it can be single-stepped through the program, with a disassembly of the instruction executed displayed. Commands are available which allow single-stepping to continue after a jump or call. This, like the assembler, is a most comprehensive tool. The DevPac will appeal to the true machine-code freak who wants to write a lot of software. The documentation is first class.

The first thing that you notice about this neat product, the Editor Assembler by Picturesque, is that instead of the normal 32 columns on the screen it gives you 40. This is a very real advantage for listing the assembled source program. The whole package is very friendly and easy to use. The line editor is quick and simple to use.

The line is automatically set up with tabs at the required places. This is the fastest editor to use of all those reviewed. The only criticism is that characters cannot be inserted within a line without first deleting characters from the end of the line back to the required point.

The assembler is fast and the listing produced is very easy to read because of the 40-column line. The listing can be turned off or sent to the printer at assembly time. An extremely useful function, especially for those with 16K machines, is that once a module of source code has been assembled it can be cleared from the text buffer whilst retaining the symbol table. Thus a large program can be split into smaller modules and still be assembled, even with label references which cross module boundaries. To help this there is an assembler directive, DefL, available which allows a label value to be redefined within a program. Source and object code can be saved to tape from within the assembler.

A monitor program, which has all the normal monitor commands and includes a disassembler, is also available and documentation for both products is very good.

The Picturesque and Crystal Computing products can be highly recommended for those who are just about to start programming in machine code, whilst for those who are already familiar with the techniques then the DevPac is most highly recommended. ■

Table 1.

Company	ACS	Artic	Bug-Byte	CP	Crystal	Hisoft	Picturesque
Product name	Ultra-violet	Assembler	Aspect	Assembler	Zeus	Gens	Assembler
16K	Yes	No	Yes	Yes	No	Yes	Yes
48K	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Label size	Any	Any	Any	3	14	6	5
Hex	No	Yes	Yes	Yes	Yes	Yes	Yes
Decimal	Yes	Yes	Yes	No	Yes	Yes	Yes
ORG	Yes	Yes	Yes	No	Yes	Yes	Yes
EQU	Yes	Yes	Yes	No	Yes	Yes	Yes
DEFB	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DEFW	Yes	Yes	Yes	No	Yes	Yes	Yes
DEFM	Yes	Yes	Use DB	No	Yes	Yes	Yes
DEFS	No	No	Yes	No	No	Yes	Yes
ENT	No	No	No	No	Yes	Yes	No
Cond assembly	No	No	No	No	No	Yes	No
Opt assembly	No	No	No	No	No	Yes	No
Save to tape	Basic	Basic	Basic	Basic	Basic	Yes	Yes
Error reports	5	6	4	5	10	17	8
Output to printer	Yes	Yes	No	Yes	Yes	Yes	Yes
Listing	Yes	No	Yes		No	Yes	Yes
Editor	Basic	Screen	Line	Basic	Screen	Line	Line
Documentation	Sparse	Good	Poor	Poor	Good	Excellent	Excellent
Monitor included	No	Yes	No	No	Yes	No	No
Monitor separate	No	No	No	No	Yes	Yes	Yes

THE
Midland Computer Fair

Personal computers
Home computing
Small business systems

BINGLEY HALL, BIRMINGHAM
28-30 APRIL 1983

Thurs & Fri 10am – 6pm
Saturday 10am – 5pm

Presented by YOUR COMPUTER **Practical Computing**

This event is the first of its kind in the Midlands, and gives you the opportunity to see and compare the enormous range of personal and home computers, small business systems, microcomputers, software packages, cassettes and scores of the very latest computer games – try them for yourself – decide how much, or how little it takes to build up your own personal computer system.

HOW TO GET THERE

BY RAIL Concessionary rail fares are available direct to New Street Station. Further details are available from, British Rail Travel Centre, New Street Station, Birmingham B2 2QA Tel: 021 643 2711.

BY BUS every few minutes from New Street, Corporation Street, Colmore Row and Bull Ring.

BY CAR Bingley Hall is situated close to the city centre and is within easy access to the M1, M5 and M6. Bingley Hall will be road signed by the AA.

Admission prices – Adults £2.00 Children under 16 and O.A.P's £1.00. Party Booking: For groups of over 20 people – adults £1.50 children 75p, (plus a free ticket per 20 sold for the organiser or teacher).

Please send . . . . .adult . . . . .child tickets Enclosed remittance £ . . . .

NAME . . . .

ADDRESS . . . .

. . . . **TELEPHONE NO** . . . .

Send to Midland Computer Fair Ticket Office, I.P.C. Exhibitions, Surrey House, Throwley Way, Sutton, Surrey Tel: 01-643 8040



BAT

BATTLE TANKS is a Dragon 32 game for two players using the joystick controls. There is a choice of four options. First is an enclosed screen where each player blasts away at the other tank without any restrictions. However, the tanks have limited shell ranges. In the second version the players have barriers to hide behind to escape from their enemy. However, each can drive or fire off the edges of the picture, returning at the opposite side to catch the enemy unawares.

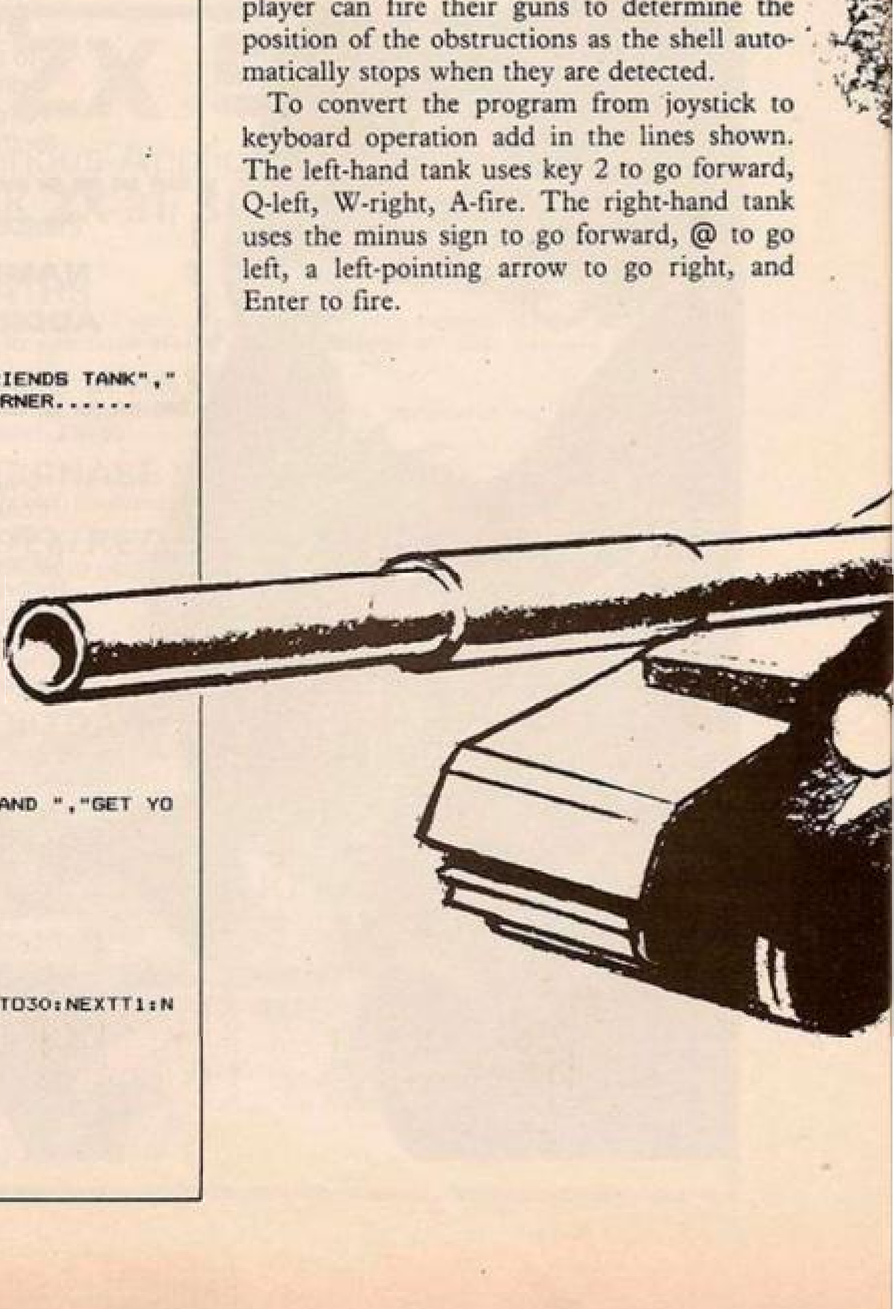
Minefields, the third option, is displayed on an apparently clear screen. Hidden within the picture are three randomly-positioned mines. If you ride over these mines you are blown up and lose a penalty point. The hidden mines are achieved by Poking on to the picture the value 240. This corresponds to the black in the orange colour set as opposed to the black value 128 normally displayed by the Dragon.

The final option, Force Field, employs the use of the value 240 and Pokes this on to the screen to form invisible walls to negotiate. The object of all the games is to score 10 hits to win. With the hidden mines and walls the player can fire their guns to determine the position of the obstructions as the shell automatically stops when they are detected.

To convert the program from joystick to keyboard operation add in the lines shown. The left-hand tank uses key 2 to go forward, Q-left, W-right, A-fire. The right-hand tank uses the minus sign to go forward, @ to go left, a left-pointing arrow to go right, and Enter to fire.



```
10 REM**************************
20 REM******BATTLE TANKS*******
30 REM**********BY*************
40 REM*****V.COCKETT ESQ.******
50 REM**************************
60 PCLS:CLS0:DIMA(7,4)
70 DATA32,165,173,154,160,33,173,168,171,153,1,160,172,174,147,-31,150,174,162,1
67,-32,149,160,170,171,-33,173,153,171,161,-1,167,156,160,163,31,164,174,150,167
80 FORT=0TO7:FORT1=0TO4:READA(T,T1):NEXT:NEXT
90 GOSUB610
100 GOSUB370
110 L=&H4E1:R=&H4F7:M=32:M2=32:Y=1
120 R1=165:R2=173:R3=154:R4=160:L1=R1:L2=R2:L3=R3:L4=R4
130 PRINT@33,HL;:PRINT@60,HR;
140 IFHL=10 ORHR=10 THEN1080
150 LR=JOYSTK(0):LM=JOYSTK(1):RR=JOYSTK(2):RM=JOYSTK(3)
160 PLAY"V3T25503CFC
170 IFLM<5 THENX1=L:C=128:XL=1:GOSUB600
180 IFRM<5 THEN X1=R:C=128:XR=1:GOSUB600
190 IFPEEK(L-M)>239 ORPEEK(L-1-M)>239 ORPEEK(L-31-(2*M))>239 ORPEEK(L-32-(2*M))>
239 THEN210
200 IFXL=1 THENL=(L-M)-((L<&H400)*512)+((L>&H615)*512):GOTO220
210 IFG=3 THENX=L:HL=HL-1:GOSUB1030:C=128:X1=R:GOSUB600:GOSUB1140:GOTO950
220 GOSUB350
230 IFPEEK(R-M2)>239 ORPEEK(R-1-M2)>239 ORPEEK(R-31-(2*M2))>239 ORPEEK(R-32-(2*M
2))>239 THEN250
240 IFXR=1 THENR=(R-M2)-((R<&H400)*512)+((R)&H615)*512):GOTO260
250 IFG=3 THENX=R:HR=HR-1:GOSUB1030:C=128:X1=L:GOSUB600:GOSUB1140:GOTO950
260 GOSUB360
270 P=PEEK(&HFF00):IFP=125 ORP=253 THENX=(R-(2*M2)):R5=X:F=M2:GOSUB420
280 IFP=126 ORP=254 THENX=(L-(2*M)):L5=X:F=M:GOSUB420
290 IFY=0 THEN110
300 M1=M:IFM=1 ORM=-32 THENM1=-M1
310 M3=M2:IFM2=1 ORM2=-32 THENM3=-M3
320 IFLR<5 ORLR>59 THEN AR=(AR+(1*SGN(32-LR)))+((AR=0 ANDLR>59)*-8)+((AR=7 ANDLR
<5)*8):M=A(AR,0):L1=A(AR,1):L2=A(AR,2):L3=A(AR,3):L4=A(AR,4):GOSUB350
330 IFRR<5 OR RR>59 THEN BR=(BR+(1*SGN(32-RR)))+((BR=0 ANDRR>59)*-8)+((BR=7 ANDR
R<5)*8):M2=A(BR,0):R1=A(BR,1):R2=A(BR,2):R3=A(BR,3):R4=A(BR,4):GOSUB360
335 XL=0:XR=0
340 GOTO150
350 POKEL,L1:POKEL+1,L2:POKEL-31,L3:POKEL-32,L4:RETURN
360 POKER,R1:POKER+1,R2:POKER-31,R3:POKER-32,R4:RETURN
370 FORT=0TO4:POKE&H44D+T,255:POKE&H5AD+T,255:NEXT
380 FORT=0TO192 STEP32:POKE&H484+T,255:POKE&H49B+T,255:NEXT
390 FORT=0TO64 STEP32:POKE&H4CA+T,255:POKE&H4D5+T,255:NEXT
400 POKE&H46D,255:POKE&H471,255:POKE&H483,255:POKE&H49C,255:POKE&H4EF,255:POKE&H
543,255:POKE&H55C,255:POKE&H58D,255:POKE&H591,255
410 RETURN
420 FORT2=1TO12:Y$=STR$(13-T2):PLAY"V2003":PLAY+Y$
430 IFPEEK(X)>148 AND PEEK(X)<175 THEN510
440 IFPEEK(X)>239 THEN POKEX+F,128:S=225:FORT=1TO4:S=390-S:SOUNDS,1:NEXT:RETURN
450 OF=X
460 POKEX,196
470 X=X-((X<&H420)*512)+((X>&H600)*480)-F
480 POKEOF,128
490 NEXT
500 POKEX+F,128:RETURN
510 R5=R5-(T2*F)+F:L5=L5-(T2*F)+F
520 POKEX+F,128:FORT=1TO6:FORT1=1TO3
530 C=(16*T1)+175:C$=STR$(T1*4):PLAY"V31":PLAYC$
540 IFX=R5 THEN X1=L:GOSUB600:NEXTT1:E=0:NEXT:HR=HR+1
550 IFX=L5 THEN X1=R:GOSUB600:NEXTT1:E=0:NEXTT:HL=HL+1
560 C=128:GOSUB600
570 IFX1=L THENX1=R:C=128:GOSUB600
580 IFX=L5 THEN X1=L:C=128:GOSUB600
590 Y=0:RETURN
600 POKEX1,C:POKEX1+1,C:POKEX1-31,C:POKEX1-32,C:RETURN
610 CLS:PRINT"********************************";
620 PRINT"********** BATTLE TANKS *********";
630 PRINT"********************************"
640 PRINT@160," USING YOUR JOYSTICK YOU HAVE "," TO DESTROY YOUR FRIENDS TANK","
 BEFORE HE GETS YOU.BE CAREFUL"," HE MAYBE HIDING AROUND THE "," CORNER......
650 PRINT@352," BE SURE TO CHOOSE YOUR FRIENDS"," WITH CARE!!!
660 PRINT@454,"PRESS SPACE TO PLAY
670 IFINKEY$<>" " THEN670
680 CLS
690 PRINT@65,"PLEASE SELECT GAME:-
700 PRINT@168,"1----BATTLE FIELD
710 PRINT@205,"(IT'S A SHOOT OUT)
720 PRINT@264,"2----HIDE & SEEK
730 PRINT@301,"(MIND THE BARRIERS)
740 PRINT@360,"3----MINE FIELD
750 PRINT@397,"(BEWARE THE MINES)
760 PRINT@456,"4----FORCE FIELD
770 PRINT@493,"(HIDDEN BARRIERS)
780 G$=INKEY$:IFG$=""THEN780
790 IFVAL(G$)<1 ORVAL(G$)>4 THEN780
800 G=VAL(G$):CLS:GOTO830
810 CLS:GOTO830
820 PRINT@34,"NOW YOU KNOW WHO IS'NT YOUR "," FRIEND...WHY NOT TRY AND ","GET YO
UR OWN BACK!!!!
830 PRINT@165,"PLEASE SELECT:-
840 PRINT@232,"A----AMATEUR
850 PRINT@296,"P----PROFESSIONAL
860 PRINT@360,"E----TO END
870 A$=INKEY$:IFA$="" THEN870
880 IFA$="A" THENPOKE65494,0:GOTO920
890 IFA$="P" THENPOKE65495,0:GOTO920
900 IFA$="E" THENPOKE65494,0:FORT=0TO8:CLST:SOUND(T+1)*25,1:FORT1=1TO30:NEXTT1:N
EXT:SOUND25,4:END
910 GOTO870
920 CLS0
930 HL=0:HR=0
940 IFG=2 THEN100
950 IFG=3 THENGOSUB1000:GOTO110
960 IFG=4 THENGOSUB1010
```



TLE TANKS

DRAGON

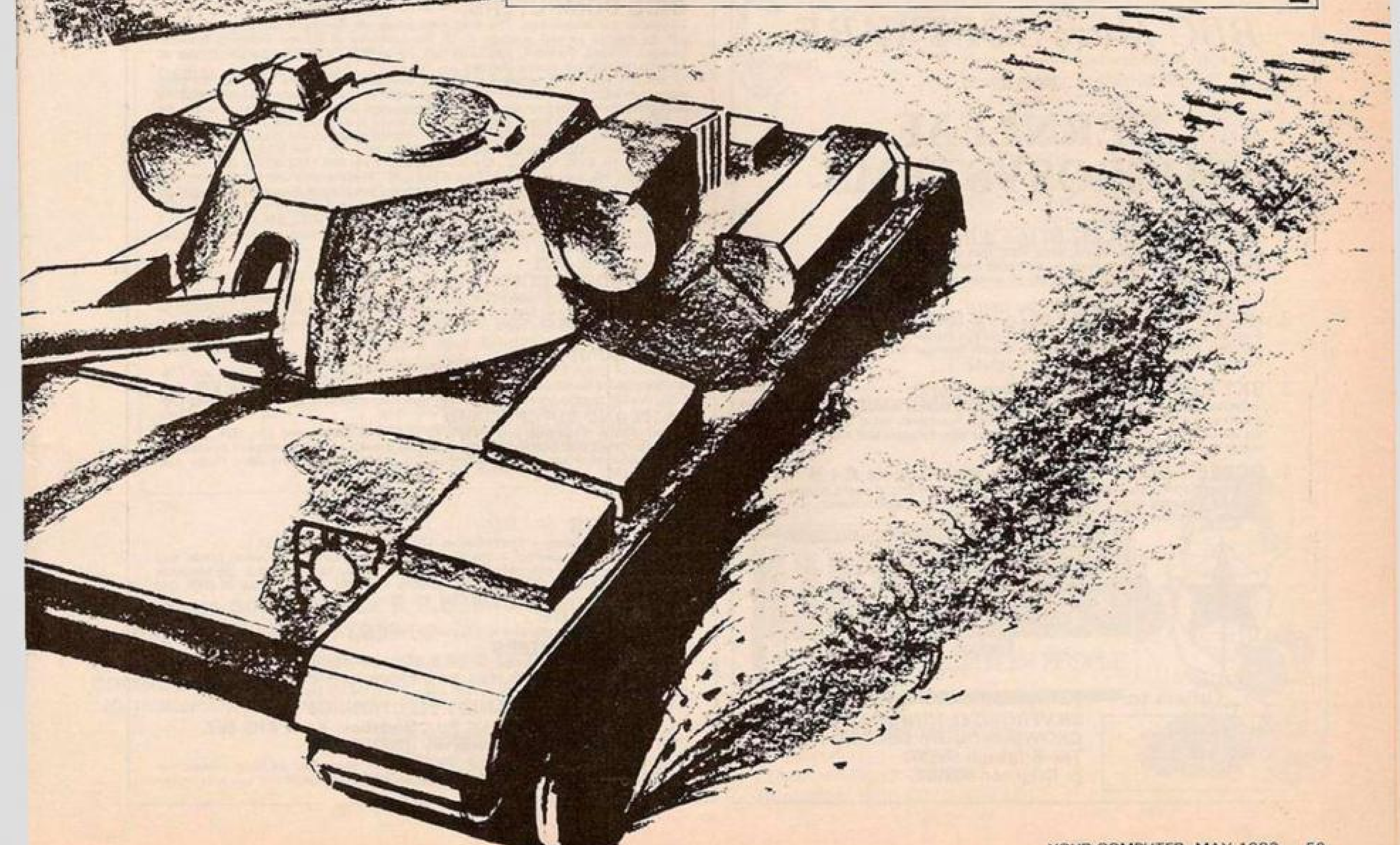
As the steel tide of war rips across the disputed zone, you get your free invitation to take part in the holocaust, courtesy of Vincent Crockett.
Can you and the crew of your main battle tank survive?

```
970 FORT=0TO31:POKE&H400+T,255:POKE&H5E0+T,255:NEXT
980 FORT=1TO14:POKE&H400+(T*32),255:POKE&H41F+(T*32),255:NEXT
990 GOTO110
1000 CLS0:FORT=0TO2:POKE&H421+RND(360),240:NEXT:RETURN
1010 FORT=0TO4:POKE&H487+T,240:POKE&H574+T,240:POKE&H50B+(T*32),240:POKE&H45A+(T
*32),240:NEXT
1020 RETURN
1030 A=42:SOUND4,1:GOSUB1050:A=159:GOSUB1050:A=102:SOUND15,1:GOSUB1050:A=175:SOU
ND50,1:GOSUB1050
1040 A=87:SOUND100,1:GOSUB1050:A=255:SOUND4,1:GOSUB1050:A=128:SOUND35,1:GOSUB105
0
1050 POKEX,A:POKEX+1,A:POKEX-1,A:POKEX+32,A:POKEX-32,A
1060 POKEX+2,A:POKEX-2,A:POKEX+64,A:POKEX-64,A
1070 POKEX+31,A:POKEX+33,A:POKEX-33,A:POKEX-31,A:RETURN
1080 PRINT@449,"AGAIN (Y/N) OR CHANGE GAME (C)";
1090 A$=INKEY$:IFA$="" THEN1090
1100 IFA$="Y" THENFORT=1473 TO1502:POKET,128:NEXT:GOTO920
1110 IFA$="N" THENA$="E":GOTO900
1120 IFA$="C" THEN680
1130 GOTO1090
1140 PRINT@449,"LOST ONE PENALTY POINT";
1150 FORT=1TO500:NEXT
1160 FORT=1473TO1495:POKET,128:NEXT:RETURN
```

Modifications for joystick control.

```
150 REM
170 IFPEEK(340)=254 THENX1=L:C=128:XL=1:GOSUB600
180 IFPEEK(343)=253 THEN X1=R:C=128:XR=1:GOSUB600
230 IFPEEK(R-M2)>239 ORPEEK(R-1-M2)>239 ORPEEK(R-31-(2*M2))>239 ORPEEK(R-32-(2*M
2))>239 THEN250
270 IFPEEK(338)=191 THENX=(R-(2*M2)):R5=X:F=M2:GOSUB420
280 IFPEEK(339)=251 THENX=(L-(2*M)):L5=X:F=M:GOSUB420
320 IFPEEK(339)=239 ORPEEK(345)=239 THEN AR=(AR+((PEEK(339)=239))*-1)+(PEEK(345)
=239)+((AR=0 ANDPEEK(345)=239)*-8)+((AR=7 ANDPEEK(339)=239)*8):M=A(AR,0):L1=A(AR
,1):L2=A(AR,2):L3=A(AR,3):L4=A(AR,4):GOSUB350
330 IFPEEK(338)=251 ORPEEK(343)=223 THENBR=(BR+((PEEK(338)=251)*-1)+(PEEK(343)=2
23))+((BR=0 ANDPEEK(343)=223)*-8)+((BR=7 ANDPEEK(338)=251)*8):M2=A(BR,0):R1=A(BR
,1):R2=A(BR,2):R3=A(BR,3):R4=A(BR,4):GOSUB360
```

■



FROG ON T

The truckers on this four-lane freeway are too busy chomping chocolate bars and watching out for sports cars to worry about a jaywalking frog: so look both ways in Desmond Phillips' Frogrun.

```
1 REM FROGRUN
2 REM (C) D.PHILLIPS
10 POKE36879,254:PRINT"██        FROGRUN        █":PRINT"██CONTROLS█":PRINT"█
U"
20 PRINT"   !":PRINT" H-+-J":PRINT"   !":PRINT"   N"
30 PRINT"█ DODGE THE TRUCKS AND  CATCH THE LOGS!"
40 PRINT"█ YOU HAVE 3 LIVES AND  30 SECONDS TO GUIDE   YOUR FROG HOME"
50 PRINT"█ ONCE ALL 3 FROGS ARE  HOME YOUR TIME LIMIT  WILL DECREASE█":GOSUB650
CLR
60 SC=0:L=3:S1=36876:F1=32:F2=32:F3=32:T%=1800:FT=0
70 OP=32:OC=1:Y=10:X=15:TI$="000000":POKE36878,15
80 PRINT"██//// //////// /// ////":PRINT"█//////////      ////"
90 PRINT"██     //////      //////":PRINT"██  ////        /////"
100 PRINT"██  ////  ///    ////":PRINT"██///////////////////////"
110 PRINT"█ (%)    (%)   (%) (%)":PRINT"███%& $%&    $%& $%&"
120 PRINT"██(%)    (%)    (%) (%)":PRINT"██ $%&   $%&     $%&███"
130 POKE7685,F1:POKE7694,F2:POKE7698,F3:POKE38405,5:POKE38414,5:POKE38418,5
140 DY=0:DX=0:A=PEEK(203):IFA=51THENDY=-1:POKES1,180
150 IFA=28THENDY=1:POKES1,190
160 IFA=43THENDX=-1:POKES1,200
170 IFA=20THENDX=1:POKES1,210
180 POKES1,0
190 IFX+DX<1ORX+DX>20THEN420
200 IFY+DY>10THEN300
210 P=PEEK(7680+X+DX+44*(Y+DY))
220 IFY>1ANDY<6ANDP=32THEN420
230 IFY>6ANDP<>32ANDP<>35THEN420
240 IFY+DY=0ANDP<>32THEN420
250 IFY+DY=0ANDP=32THEN520
260 IFDY=0ANDDX=0THEN290
270 POKE7680+X+44*Y,OP:POKE38400+X+44*Y,OC
280 OP=PEEK(7680+X+DX+44*(Y+DY)):OC=PEEK(38400+X+DX+44*(Y+DY)):SC=SC+10
290 X=X+DX:Y=Y+DY:POKE7680+X+44*Y,35:POKE38400+X+44*Y,5
300 IFY=1ORY=3THENX=X-1
310 IFY=2ORY=4THENX=X+1
320 IFY>5ANDY<10THENPOKE7680+X+44*Y,32
330 POKE2,30:POKE1,44:SYS820:POKE1,88:SYS866:POKE1,132:SYS820:POKE1,176:SYS866
340 POKE2,31:POKE1,8:SYS820:POKE1,52:SYS866:POKE1,96:SYS820:POKE1,140:SYS866
350 P=PEEK(7680+X+44*Y):IFP<>32ANDP<>35THEN420
360 IFY>5ANDY<10THENPOKE7680+X+44*Y,35:POKE38400+X+44*Y,5
370 IFSC>HITHENHI=SC
380 PRINT"T:"TI$"  L:"L
390 PRINT"S:"SC"█":PRINT"███████████H:"HI"██"
400 IFTI>T%THEN420
410 GOTO140
420 POKE7680+X+44*Y,OP:POKE38400+X+44*Y,OC
430 POKE7680+DX+X+44*(Y+DY),35:POKE38400+X+DX+44*(Y+DY),2
440 FORT=15TO0STEP-.3:POKES1-1,128+2*T:POKE36878,T:NEXT:POKE36875,0
450 L=L-1:IFL=0THEN470
460 FORT=1TO1000:NEXT:GOTO70
470 PRINT"████ ANOTHER GAME [Y/N]?"
480 POKE198,0
490 GETA$:IFA$="Y"THEN60
500 IFA$<>"N"THEN490
510 POKE2,0:SYS2
520 POKE7680+X+44*Y,OP:POKE38400+X+44*Y,OC
530 POKE7680+X+DX+44*(Y+DY),35:POKE38400+X+DX+44*(Y+DY),5
540 FORT=1TO30:FORG=200TO210:POKES1,G+T:NEXT:NEXT:POKES1,0
550 FORT=1TO1000:NEXT:SC=SC+500
560 IFX=5THENF1=35
570 IFX=14THENF2=35
580 IFX=18THENF3=35
590 FT=FT+1:IFFT=3THENFT=0:F1=32:F2=32:F3=32:T%=T%-300:SC=SC+1000
600 GOTO70
610 DATA 165,1,133,251,165,2,24,105,120,133,252,162,20,160,0,177,1,72,200,177,1
136,145
620 DATA 1,200,104,145,1,136,177,251,72,200,177,251,136,145,251,104,200,145,251
202,16
630 DATA 226,96,165,1,133,251,165,2,24,105,120,133,252,162,20,160,20,177,1,72,2
00,177,1
640 DATA 136,145,1,200,104,145,1,136,177,251,72,200,177,251,136,145,251,104,200
,145,251
650 DATA136,136,202,16,224,96:FORT=820TO913:READK:POKET,K:X=X+K:NEXT:IFX<>12468
THENSTOP
660 DATA 153,153,126,24,219,189,153,129,7,63,127,127,127,127,63,7,0,255,255,255
,255
670 DATA 255,255,0,112,254,241,241,241,241,254,112,255,255,255,255,255,255,255,
255
680 DATA 7,63,71,71,71,71,63,7,112,254,255,255,255,255,254,112,7
690 POKE56,28:POKE52,28:POKE51,0:POKE55,0:FORT=0TO511:POKE7168+T,PEEK(32768+T):
NEXT
700 FORG=7448TO7503:READK:POKEG,K:NEXT:POKE36869,255:RETURN
```

VIC-20

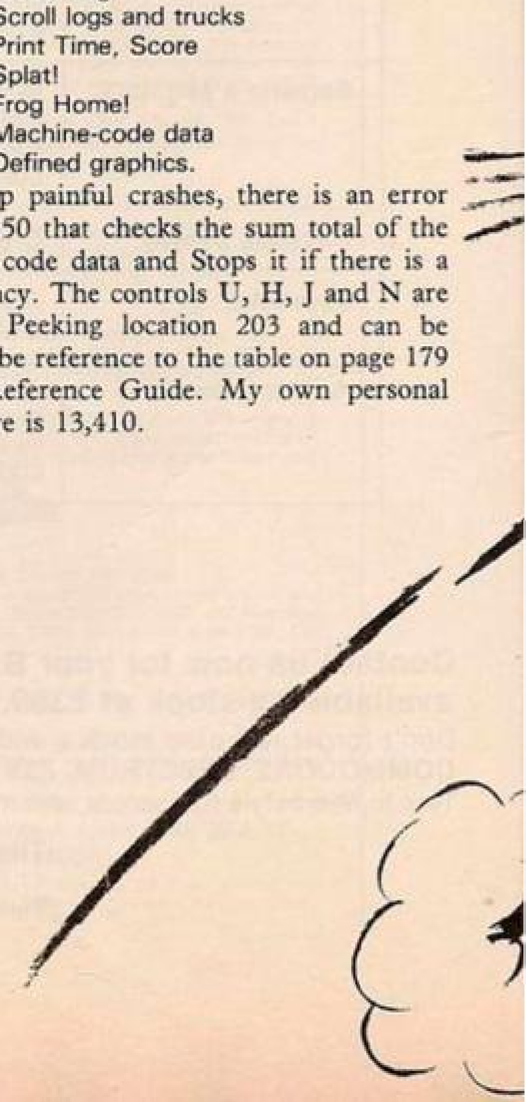
THE GAME Frogrun is designed for the unexpanded Vic-20 and uses machine code and defined graphics.

You have to guide an intrepid frog across four lanes of busy highway and safely on to the pavement. He then has to hop between the logs and make it to his home in a gap in the bank. There is a 30-second time limit — this goes down by five when three frogs have made home. You are not allowed near the edge of the screen or on the river bank.

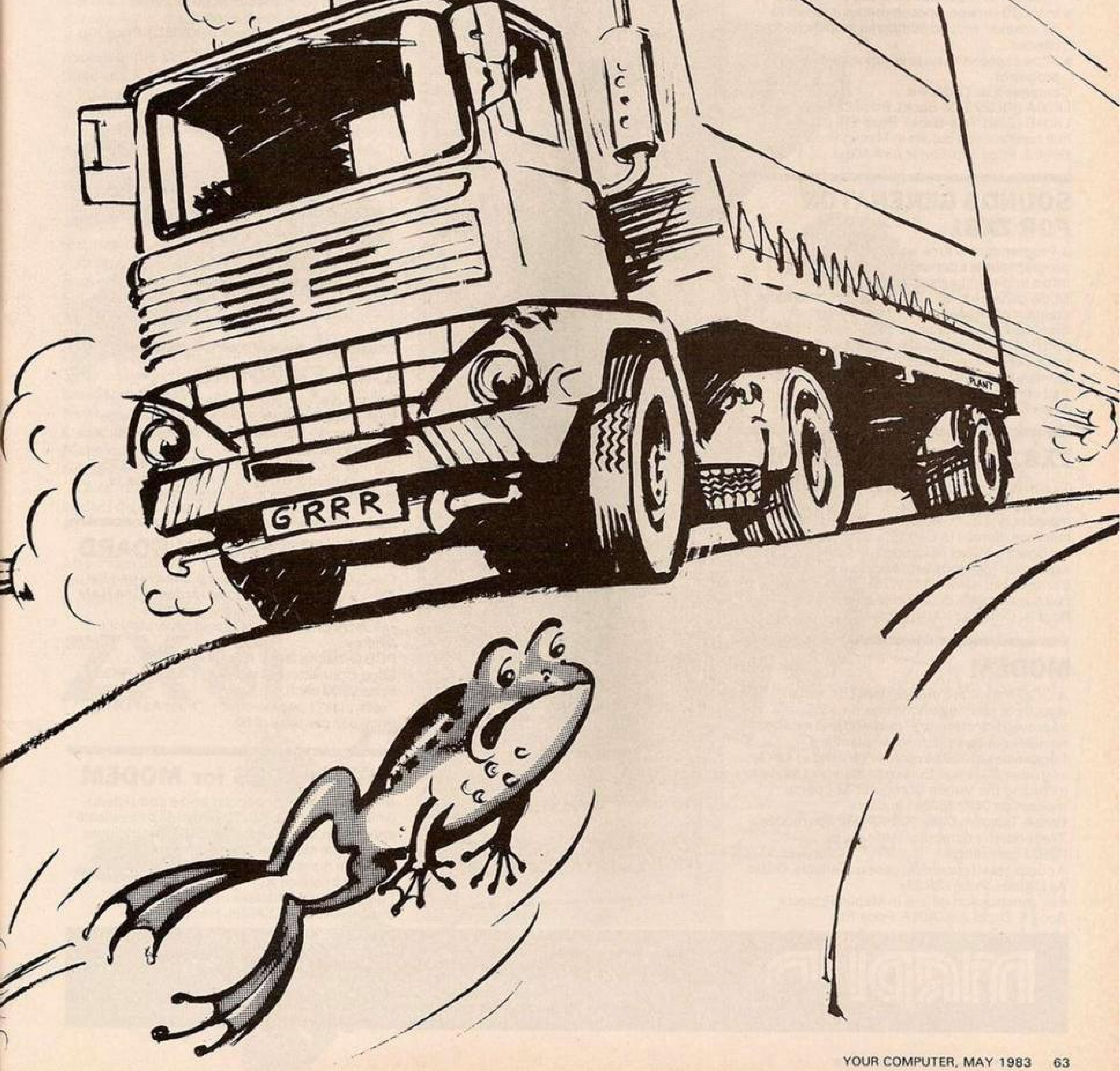
The contest finishes when three frogs have been flattened. A main loop is incorporated and various subroutines. The scrolling is done by two machine-code routines in the cassette buffer at locations 820 and 866. These scroll right and left for one line whose starting address is at location 1 and 2. Unfortunately, the machine code and defined graphics take up a lot of memory as they have to be loaded from Basic.

10-50 Title screen
60-70 Initialise variables
80-130 Print game screen
140-180 Player input
190-260 Check move
270-290 Move frog
300-360 Scroll logs and trucks
370-410 Print Time, Score
420-510 Splat!
520-600 Frog Home!
600-650 Machine-code data
650-700 Defined graphics.

To stop painful crashes, there is an error trap in 650 that checks the sum total of the machine code data and Stops it if there is a discrepancy. The controls U, H, J and N are read by Peeking location 203 and can be changed be reference to the table on page 179 of the Reference Guide. My own personal high score is 13,410.



HE HIGHWAY



EXCITING ADDITIONS FOR YOUR HOME COMPUTER

THE MAPLIN TALK-BACK for ZX81 and VIC20

Now your computer can talk

- ★Allophone (extended phoneme) system gives unlimited vocabulary.
- ★Can be used with unexpanded VIC20 or ZX81 — does not require large areas of memory.
- ★In VIC20 version, speech output is direct to TV speaker with no additional amplification needed.
- ★Allows speech to be easily included in programs.

Complete kits. Order As:
LK00A (VIC20 Talk-Back). Price £24.95.
LK01B (ZX81 Talk-Back). Price £19.95.
Full construction details in Maplin Projects Book 6. Price 70p. Order As XA06G.

SOUNDS GENERATOR FOR ZX81

3-Programmable tone generators with programmable attenuators turns your ZX81 into a mini-synthesiser.
Noise generator with 3 pitch levels enables the creation of most special effect sounds.
Single address access via BASIC with PEEK and POKE. Connects directly to expansion port socket or motherboard.
Complete kit. Order As LW96E. Price £10.95.
Full construction details in Maplin Projects Book 5. Order As XA05F. Price 70p.

ZX81 INPUT/OUTPUT PORT

Two bi-directional ports for a total of 16 input or 16 output lines.
Includes one buffered output which can interface directly to CMOS.
On board address selection allows for expansion to 6 ports with two boards.
Complete kit. Order As LW76H. Price £9.25.
Full construction details in Maplin Projects Book 4. Order As XA04E. Price 70p.

MODEM

A CCITT standard modem that connects directly to your telephone line via a B.T. approved transformer. Transmits and receives simultaneously on European standard frequencies at 300 baud. May be used to talk to any other 300 baud European standard modem including the Maplin Computer Shopping modem on 0702 552941 and any British Telecom Datel 200/300 Service modem.
The modem's computer interface is RS232 compatible.
A complete kit excluding case is available. Order As LW99H. Price £39.95.
Full construction details in Maplin Projects Book 5. Order As XA05F. Price 70p.



KEYBOARD with ELECTRONICS for ZX81

- ★ Full size, full travel keyboard that's simple to add to your ZX81 (no soldering in ZX81).
- ★ Complete with electronics to make "Shift Lock", "Function" and "Graphics 2" single key selections.
- ★ Powered (with adaptor supplied) from ZX81's own standard power supply.

Full details in Project Book 3 (XA03D). Price 70p
Complete kit (excl. case) £21.90.
Order As LW72P.
Case £4.95. Order As XG17T.
Ready built-in case £29.95.
Order As XG22Y.



ZX81 TV SOUND

ZX81 sound on your TV set.
Video reversing switch for normal or inverse video display. Can be used with the Talk-Back or Sounds Generator kits.
Complete kit. Order As LK02C. Price £19.95.
Full construction details in Maplin Projects Book 6. Order As XA06G. Price 70p.

ZX81 EXTENSION BOARD

Our ZX81 Extendiboard plugs directly into the ZX81 expansion port and will accept a 16K RAM pack and three other plug-in modules simultaneously. Parts are sold separately as follows:
PCB Order As GB08J. Price £2.32.
Edge Connectors (4 needed) Order As RK35Q. Price £2.39 each.
Track pins (1 pack needed). Order As FL82D. Price 85p per pack of 50.

INTERFACES for MODEM

Interfaces for most popular home computers which do not have RS232 ports will be available shortly. An interface for the ZX81 that includes a complete Machine Code Communications Program is available. Order As LK08J (ZX81 Modem Interface Kit). Price £24.95.
Full construction details in Maplin Projects Book 7. Order As XA07H. Price 70p.

MAPLIN

Maplin Electronic Supplies Ltd., Mail Order: P.O. Box 3, Rayleigh, Essex SS6 8LR.
Tel. Southend (0702) 552911 (Sales).

159-161 King St., Hammersmith, W6. Tel. 01-748 0926. 284, London Road, Westcliff-on-Sea, Essex. Tel. (0702) 554000. Lynton Square, Perry Barr, Birmingham. Tel. (021) 356 7292.
All prices include VAT & carriage. Please add a 50p handling charge to orders under £5 total value.

SAVED!

Andy Scott helps you attain the goal of better saving on the ZX-81 by providing a much-needed Tape Verify routine — amount of memory is not important.

An unfortunate shortcoming of the ZX-81 is the absence of a tape verify. Considering the poor quality of many tape recorders that get used with ZX-81s, and the widespread use of cassettes that have not been certified for data storage, there is a fair probability that, once in a while, a program will not be saved correctly.

Nothing is more frustrating than spending hours typing in a program, saving it and reloading it at a later date only to find it cannot be loaded due to a saving error. A Verify routine which checks the saved program against the one in memory would be a great asset.

This program is suitable for any ZX-81 — amount of memory is not important. The Verification program is in machine code and sits above RAMtop, thus being protected against New and Load. The program occupies 116 bytes, hence users of small memory ZX-81s should bear this in mind. If users already have machine-code programs above RAMtop, these will not be destroyed or relocated: the Verify program will sit between these and RAMtop.

Program 1 resets RAMtop to accommodate the routine. It looks at the existing RAMtop, reduces it by 116 bytes, then destroys itself by performing New. Because it is self-destructive, remember to Save it on tape before running it! While running, it comes up with:

```
TO VERIFY RAND USR X
```

where x is a number shown. Make a note of this number — it will be used later.

Program 2 is the verify routine. It sits in a Rem statement in line 1. After typing Rem, a follow it with 116 characters — I usually use 0. To load the machine-code program into the Rem, Run program 2. The machine-code loader used has become pretty standard in *Your Computer*. Enter the code in hexadecimal, either as a single byte plus Newline, for example, 76 N/L, or as a block at a time for example 7676CD230F plus N/L. Make sure each byte consists of two digits for example 0F and not F.

Once the machine-code program has been loaded, delete lines 10 to 90. Then put in line 10:

```
10 RAND USR 16632
```

Also Poke 16510,0. This will change the Rem line number to 0 — a safer approach since line 0 cannot be deleted. Now Save program 2 on

(continued on page 67)

ZX-81



(continued from page 65)

tape. The two Halt instructions at the beginning of the machine-code program are there to prevent the contents of the Rem statement from being listed. This is preferable for two reasons — one to prevent an awful mess from being listed and, secondly, if the machine-code program is longer than can be listed on to the screen, the ZX-81 will effectively crash.

Now Run the program. It will relocate the routine to above RAMtop, changing three absolute Calls at the same time to the correct address. It will then perform New — thus destroying the Basic program.

Now to use Verify. First put in a Basic program and Save it. Rewind the tape back to the start of the program just saved, then Rand Usr x as a direct command — where x is that number you wrote down from program 1 — remember? Now press Play on the tape recorder. Three types of report code can be shown:

0/0 program verified and is OK
D/0 Break key pressed during Verify
E/0 Error has been found on tape.

D/0 is similar to when Break is pressed during normal Load and Save. Note the use of E/0 — Sinclair does not use this report code. If an error has been found, your original program has not been destroyed — try listing it! Just re-Save the program and do Verify again.

The Verify routine does not check if system variables have been saved satisfactorily — during Verification many would be different to when saved. In between saving and verifying, do not change any user variables or define new ones — they would be different to those stored on tape and an error would be shown. The Verify program can be used within a Basic program also, for example:

```
100 SAVE "EXAMPLE"
110 PRINT "REWIND TAPE TO START OF
    EXAMPLE"
120 PRINT "THEN PRESS PLAY ON TAPE
    RECORDER"
130 PRINT "PRESS G KEY WHEN YOU HAVE
    DONE THIS"
140 IF INKEY$ <> "G" THEN GOTO 140
150 RAND USR X
```

Where X is the start of the Verify program — again the one you wrote down. ■

Program 1.

```
10 LET X=PEEK 16388+256*PEEK 16389
20 LET X=X-116
30 LET T=X/256
40 LET H=INT T
50 LET L=(T-H)*256
60 POKE 16388,L
70 POKE 16389,H
80 PRINT "TO VERIFY USE  RAND USR ";X
90 PRINT "   PRESS ANY KEY TO CONTINUE"
100 IF INKEY$="" THEN GOTO 100
110 NEW
```

Program 2.

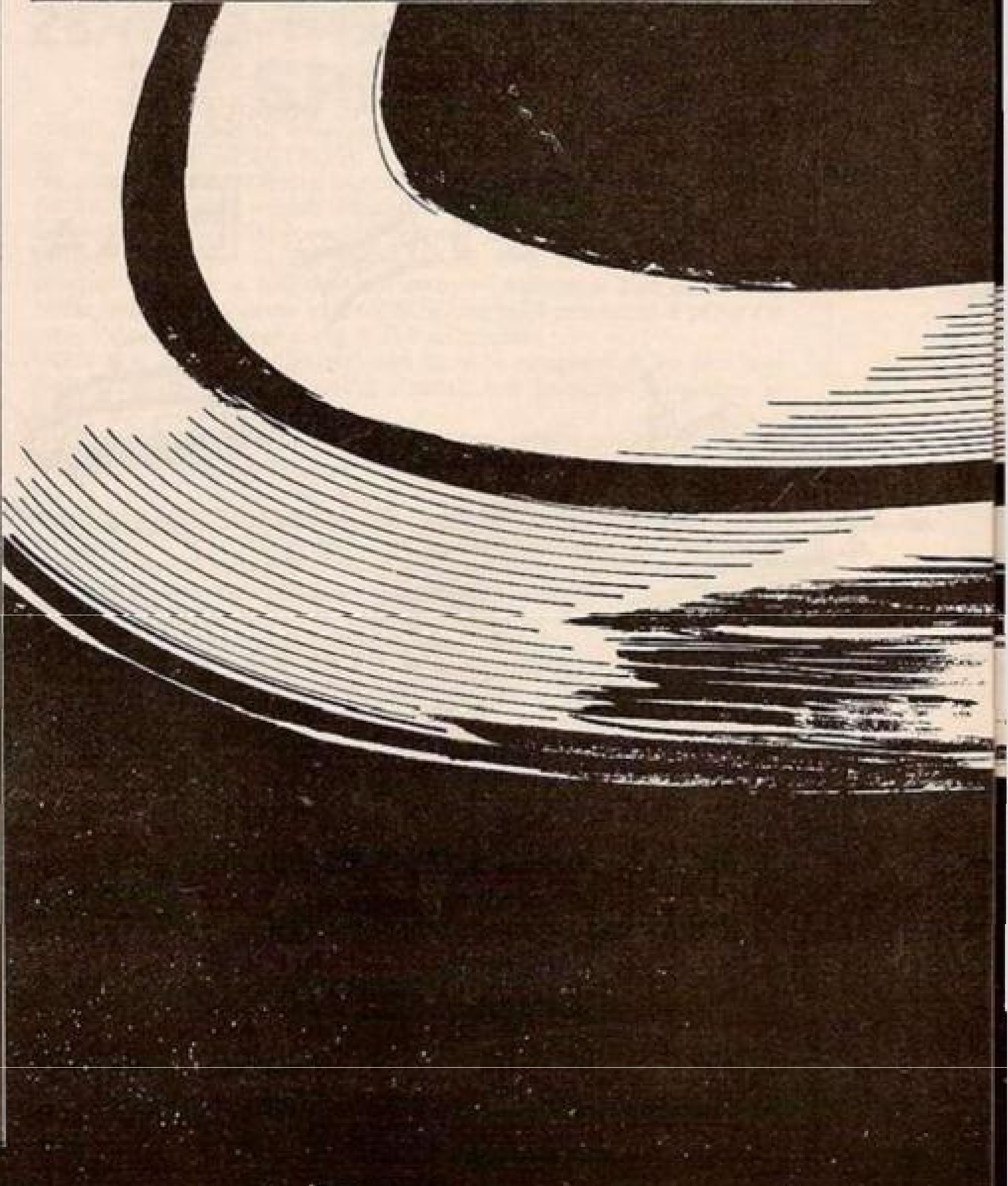
```
1 REM (fill this with 116 characters)
10 LET X=16514
20 LET A$=""
30 IF A$="" THEN INPUT A$
40 IF A$="S" THEN STOP
50 POKE X,16*CODE A$+CODE A$(2)-476
60 PRINT AT 11,7;X;" ",A$(1 TO 2)
70 LET X=X+1
80 LET A$=A$(3 TO)
90 GOTO 30
RUN (in FAST)
```

The Verify routine in machine code.

```
4082            76        HALT                   ;To prevent screen listing
4083            76        HALT
4084            CD230F    CALL 0F23,FAST
4087            37        SCF
4088            CB12      RL   D
408A            CB0A      RRC  D
408C  NEXT PROG CD9140    CALL 4091,INBYTE       ;Start tape listen
408F            18FB      JR   408C,NEXT PROG
4091  IN BYTE   0E01      LD   C,01
4093  NEXT BIT  0600      LD   B,00
4095  BREAK1    3E7F      LD   A,7F
4097            DBFE      IN   A,(+FE)           ;Test for BREAK key
4099            D3FF      OUT  (+FF),A           ;Echo to screen
409B            1F        RRA
409C            3805      JR   C,40A3,CONT1      ;JR if BREAK not pressed
409E  BREAK2    CD2B0F    CALL 0F2B,SLOW
40A1            CF        RST  08H               ; > REPORT CODE D
40A2            0C        DEFB 0C                ; > BREAK key pressed
40A3  CONT1     17        RLA
40A4            17        RLA
40A5            3834      JR   C,40DB,GET BYTE   JR Build up byte in C Reg.
40A7            10EC      DJNZ 4095,BREAK1
40A9            F1        POP  AF
40AA  PROG NAME CD9140    CALL 4091,IN BYTE
40AD            79        LD   A,C               ;Load built up byte into A
40AE            17        RLA                    ;Bit 7 of byte into Carry
40AF            30F9      JR   NC,40AA,PROG NAME ;JR if not last byte of name
40B1            210940    LD   HL,4009,VERSN     ;Start loading from 4009
40B4  VERIFY    CD9140    CALL 4091,IN BYTE      ;Byte from tape into C reg.
40B7            117940    LD   DE,4079           ;Start of Basic prog. into DE
40BA            A7        AND  A                 ;Clear carry
40BB            E5        PUSH HL                ;Save address count
40BC            ED52      SBC  HL,DE             ;Are we up to Basic prog?
40BE            E1        POP  HL                ;Retrieve address count
40BF            3804      JR   C,40C5,CONT2      ;And if not,do not verify
40C1            79        LD   A,C               ;Byte from tape into A
40C2            BE        CP   (HL)              ;Do Byte VERIFY
40C3            2011      JR   NZ,40D6,ERROR     ;JR ERROR if verify false
40C5  CONT2     23        INC  HL                ;HL points to next address
40C6            ED5B1440  LD   DE,(E-LINE)
40CA            A7        AND  A                 ;Clear carry
40CB            E5        PUSH HL                ;Save address count
40CC            ED52      SBC  HL,DE             ;Are we up to E-LINE?
40CE            E1        POP  HL                ;Retrieve address count
40CF            20E3      JR   NZ,40B4,VERIFY    ,And if not cont. to verify
40D1  OK        CD2B0F    CALL 0F2B,SLOW
40D4            CF        RST  08H               ;)No errors -
40D5            FF        DEFB FF                ;)REPORT CODE 0
40D6  ERROR     CD2B0F    CALL 0F2B,SLOW
40D9            CF        RST  08H               ;)ERROR -
40DA            0D        DEFB 0D                ;)REPORT CODE E
40DB  GET BYTE  D5        PUSH DE
40DC            1E94      LD   E,94              ;  Timing
40DE  TRAILER   061A      LD   B,1A              ;  Loops
40E0  COUNTER   1D        DEC  E
40E1            DBFE      IN   A,(+FE)           ;Pick up tape signal
40E3            17        RLA
40E4            CB7B      BIT  7,E
40E6            7B        LD   A,E               ;  Build up
40E7            38F5      JR   C,40DE,TRAILER    ;  Byte in
40E9            10F5      DJNZ 40E0,COUNTER      ;  C Register
40EB            D1        POP  DE
40EC            2004      JR   NZ,40F2,BIT DONE
40EE            FE56      CP   56
40F0            30A1      JR   NC,4093,NEXT BIT
40F2  BIT DONE  3F        CCF
40F3            CB11      RL   C
40F5            309C      JR   NC,4093,NEXT BIT
40F7            C9        RET                    ;RETURN
40F8  BLOCKMOVE 2A0440    LD   HL,(RAMTOP)       ;Put address of RAMTOP in HL
40FB            010D00    LD   BC,000D
40FE            09        ADD  HL,BC             ;address for INBYTE in HL
40FF            228D40    LD   (408D),HL
4102            22AB40    LD   (40AB),HL
4105            22B540    LD   (40B5),HL
4108            218440    LD   HL,4084           ; )Transfer programme
410B            ED5B0440  LD   DE,(RAMTOP)       ; ) (4084 to 40F7)
410F            017400    LD   BC,0074           ; )to above RAMTOP
4112          . EDB0      LDIR
4114            CDC303    CALL 03C3,NEW

      Users of old Sinclair ROMS note the following changes:
          4084-4086   CD200F
          409E-40A0   CD280F
          40D1-40D3   CD280F
          40D6-40D8   CD280F
      Or alternatively, load the machine code programme as described above,
then POKE 16517,32; POKE 16535,40; POKE 16594,40; POKE 16599,40
```

```
   1 REM SATURN LANDER
   2 REM © G. OWEN,MARCH 1983
   3 GO TO 20
  10 PLOT SX,SY: PLOT SX,SY+1: D
RAW 3,0: PLOT SX+3,SY: PLOT SX+1
,SY+2: PLOT SX+2,SY+2
  11 RETURN
  20 PAPER 0: BORDER 0: INK 5: C
LS : OVER 1
  21 PLOT 0,0: DRAW 10,20: DRAW
9,-10: DRAW 8,6: DRAW 14,-10: DR
AW 6,4
  22 DRAW 4,-4: DRAW 8,6: DRAW 1
4,-10: DRAW 16,0
  24 DRAW 0,1: DRAW -16,0: DRAW
OVER 0;16,-1
  26 DRAW 14,6: DRAW 4,-4: DRAW
18,8: DRAW 6,-2: DRAW 3,4
  28 DRAW 10,-10: DRAW 10,6: DRA
W 8,12: DRAW 10,-8: DRAW 8,4
  30 DRAW 16,-10: DRAW 24,14: DR
AW 8,-10: DRAW 4,2: DRAW 8,-10
  32 DRAW 10,-4
  35 RANDOMIZE : FOR S=1 TO RND*
100: LET L=USR 32300: NEXT S
  40 LET R$="AB  CD  AB  CD AB
CD  AB AD CB "
  45 PRINT AT 12,0;R$;AT 15,0;R$
: LET R$=R$(15 TO )+R$( TO 14):
PRINT AT 17,0;R$
  50 LET R$="EFG  KLM   KLM   EF
G  EFG  KLM  HIJ  NOP   NOP   HI
J  HIJ  NOP  "
  55 PRINT INK 5;AT 4,0;R$;AT 8,
0;R$
  60 LET SX=RND*100+75: LET SY=1
65
  61 LET HV=0: LET VV=0
  62 LET S=0
  64 GO SUB 10
  65 IF POINT (SX,SY-1)+POINT (S
X+1,SY-1)+POINT (SX+2,SY-1)=3 TH
EN GO TO 2000
  66 LET OSX=SX: LET OSY=SY
  67 LET SX=SX+HV
  68 LET SY=SY-VV: IF SY>165 THE
N LET VV=0
  69 LET NSX=SX: LET NSY=SY: LET
 SX=OSX: LET SY=OSY
  70 GO SUB 10
  71 LET SX=NSX: LET SY=NSY
  72 LET S=S+1-(INKEY$<>"")
  75 LET L=USR 32200
  76 LET HV=HV+.25*((INKEY$="2"
AND SX<250 AND HV<=3)-(INKEY$="1
" AND SX>2 AND HV>=-3))
  77 LET VV=VV+.25-.5*(INKEY$="0
")
  78 INPUT "": PRINT #1;"VERT.VE
L=";INT (VV*100)/100,"HOR.VEL=";
INT (HV*100)/100
  80 IF POINT (SX,SY)+POINT (SX,
SY+1)+POINT (SX+1,SY+1)+POINT (S
X+1,SY+2)+POINT (SX+2,SY+1)+POIN
T (SX+2,SY+2)+POINT (SX+3,SY)+PO
INT (SX+3,SY+1)<>0 THEN GO TO 10
00
 200 GO TO 64
1000 FOR F=0 TO 30: OVER (F/2=IN
T (F/2)): INK 2: PLOT SX,SY: DRA
W 3,2
1010 PLOT SX,SY+2: DRAW 3,-2
1020 OUT 254,55*(F/2=INT (F/2))
1030 NEXT F
1035 INK 7
1040 OUT 254,0
1050 PRINT OVER 0;AT 10,11; FLAS
H 1;"GAME OVER"
1055 PRINT TAB 11;"SCORE=";S
1360 STOP
2000 IF ABS HV>.25 OR SY>5 THEN
GO TO 1000
2010 FOR X=10 TO 50 STEP 5: BEEP
 .1,X: NEXT X
2015 INK 7
2020 PRINT AT 10,12; FLASH 1;"WE
LL DONE"
2030 PRINT TAB 11;"SCORE=";200-S
8998 STOP
8999 PRINT "PLEASE WAIT WHILE DA
TA IS POKED"
9000 RESTORE 9000: FOR U=0 TO 12
7
9010 READ DATUM: POKE USR "A"+U,
DATUM: NEXT U
9020 DATA 0,15,31,31,63,63,7,0,0
,192,224,248,252,252,192,0
9030 DATA 0,1,15,31,127,63,31,0,
0,224,252,254,254,248,240,0
9040 DATA 0,0,0,3,15,31,63,61,0,
0,0,248,254,255,255,255,0,0,0,0,
0,0,128,192
9050 DATA 126,127,127,127,127,63
,15,0,247,15,255,255,255,255,255
,255,224,240,BIN 10110000,BIN 10
111000,BIN 01111000,DATUM,240,0
9060 DATA 0,0,0,0,0,1,3,15,0,0,0
,0,127,255,255,255,0,0,0,0,128,2
24,240,248
9070 DATA BIN 00110111,111,111,B
IN 00110111,31,3,0,0,251,247,239
,223,255,255,0,0,248,248,240,240
,128,0,0,0
9500 RESTORE 9500: READ clr: CLE
AR clr
9505 READ ADD
9510 LET A$=""
9520 IF A$="" THEN READ A$
9525 IF A$="N" THEN GO TO 9505
9526 IF A$="S" THEN STOP
9540 IF CODE A$(1)>64 THEN LET A
$(1)=CHR$ (CODE A$(1)-7)
9550 IF CODE A$(2)>64 THEN LET A
$(2)=CHR$ (CODE A$(2)-7)
9560 POKE ADD,16*CODE A$+CODE A$
(2)-816
9570 LET ADD=ADD+1
9580 LET A$=A$(3 TO )
9590 GO TO 9520
9600 DATA 31999
9610 DATA 32000,"C5D5E5F52B11200
00608C5237ECB172BF519F10620CB162
B10FB24C110ECF1E1D1C1C9N"
9620 DATA 32100,"C5D5E5F51120000
608C52B197ECB1FF5A7ED5223F10620C
B1E2310FBA7ED5224C110E6F1E1D1C1C
9N"
9630 DATA 32200,"218040CD007D21A
040CD007D210048CD647D212048CD647
D218048CD007D21E048CD647D212050C
D007DC9N"
9640 DATA 32300,"216050CD647D218
050CD647D21A050CD647DC9N"
9700 DATA 0,"S"
```



SATURN LANDER

Landing on the surface of the planet Saturn from an equatorial orbit is not an easy number. Garry Owen's 16K Spectrum program will help you run rings round space pilots who boast about working in the asteriod belt.

YOU ARE IN command of the first manned mission to Saturn. Your object is to land on the planet's surface but to get there you have to navigate through the rocks which make up Saturn's rings whilst compensating for the strong gravity.

The program, for a 16K Spectrum, is mainly Basic but four machine-code routines are used. The routine at 32000-32024 scrolls one line right to left by one pixel and the routine at 32100-32139 scrolls one line left to right by one pixel.

Each of these needs the address of the first byte of the top row of the line to be scrolled supplied to it in the hl register to work.

The routine at 32200-32242 calls the two scroll routines and provides the correct addresses. This moves the rocks. The routine at 32300-32318 positions the landscape so that the landing pad is a random number of pixels from the edge of the screen.

The data for the machine-code routines is held in Data statements, in hexadecimal, in lines 9610-9640 and Poked into memory by lines 9500-9590 after RAMtop has been lowered to 31999 — lines 9500 and 9600.

The data for the user-defined graphics — lines 9020-9070 — is Poked into place by lines 9000 and 9010. Note that the capital letters in lines 40 and 50 are the graphics characters on those keys.

Type in the program as shown and before attempting to Run it, Save it so that it auto-runs from line 8999 on Loading, that is

SAVE"SATURN"LINE 8999

This ensures that all the data is set up before the program is Run. Verify it, New the program and reload. You should get the message

PLEASE WAIT WHILE DATA IS POKED

The program is now ready to run.

The controls are:

1 to accelerate to the left
2 to accelerate to the right
0 to accelerate upwards

Note that if you are already moving in the opposite direction to that which you want to go, you will slow down first. Watch the velocity readings at the bottom of the screen.

The remaining program structure is as follows:

10-11	draw lander
20-35	draw landscape and move it
40-55	prints rocks on screen
60-62	initialise variables
64-200	main program
1000-1060	crash routine
2000-2030	successful landing routine

The variables used are SX and SY which give the co-ordinates of the lander, and HV and VV — horizontal and vertical velocities. ■




meanest,
er wave of the most
ds your space
ual Plasma Disruptors and
e haven't you?
RUM (16K or 48K)
achine code with 12 different alien types,
ole animation and explosive effects, sound and the
est, smoothest hi-res graphics ever!
VIC-20 (any memory size)
100% machine code with eight different alien types,
smooth hi-res multicolour graphics and animation, narrow
playfield and sensational sound effects.
Keyboard or joystick.
Game design and software by D. H. Lawson.
for any ZX SPECTRUM.
It's my own fault, I even volunteered.
I thought that with the space-dozer and its shovel and skyhook
it would be easy shifting the galaxy's rubbish.
Childs play. HUH! They warned me of the weird packaging,
the trays, the rods, and all the rest.
But they didn't say I'd have to stop and control not just one but two
or even more garbage pods. Then prod them, push
them, toward that black hole, and oh, it's so very, very
black, and so lonely, so empty.
Panic, mustn't panic, but they won't stop, twirling and
spinning and turning, always turning, towards me, against
me, at me. And I'm alone.
No way out, nowhere to hide, on my own, my own . . . own. . . .
SCHIZOIDS: NOT JUST A GAME, BUT A STATE OF MIND.
SCHIZOIDS features real-time animated 3d graphics for a
breathtaking visual experience, plus sound and all those arcade
features you'd expect from IMAGINE.
Game design and Software by Peter Paranoid and
the Yid Kids. (D.H.L.)
Wacky Waiters
the wildest, zaniest way of earning a
fast buck. With crazy guests screaming for
service you're gonna have to be
quick to pick up the tips, don't slap the drinks,
as you dodge the drunks and
dart from elevator to elevator, coz if the Boss
man spots you, your gonna be
out on your but. 100% machine code,
incredible animation, super smooth hi-res
multicolour graphics, authentic
sound effects and special playfield.
Keyboard or joystick control.
Yet another high performance
Arcade quality experience
for any Commodore
Vic-20.
Game design and
software by
Eugene Evans.
WACKY
WAITERS


WATCH OUT FOR THEM...
Barney
bootlace
had never had
it so bad, demoted
from ace detective of
the aristocracy to the
level of a mere store
detective he wanders his
now well worn beat around the
jewellery and watch counters
considering his
life for the hardened
he has to look after
valuable umbrellas
lost property
expect the
or a planted
Catcha Snatcha
imagine
..the name of the game



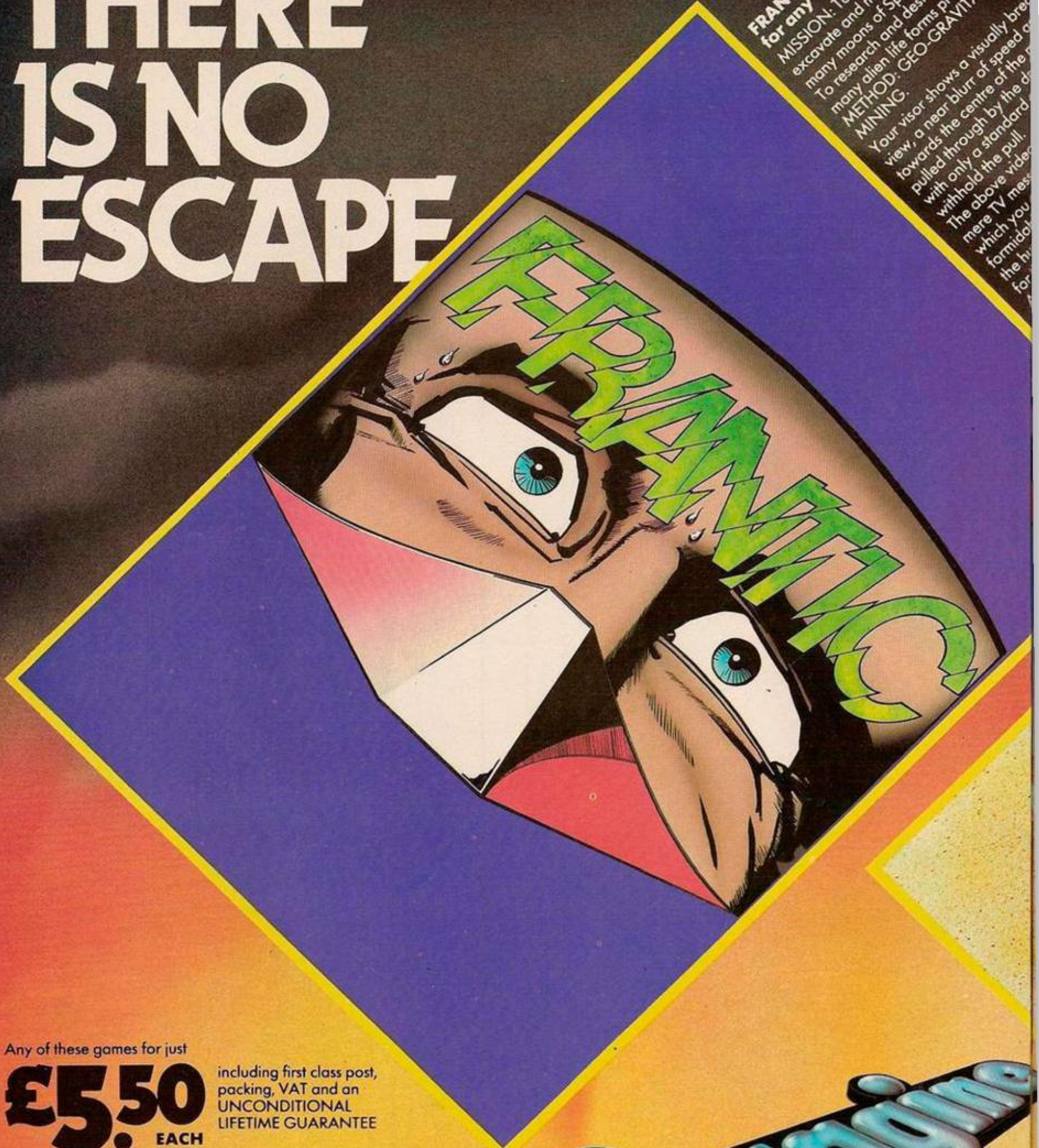
bomb to add to the fun and
SNATCHA brings to your
the mad, mad world of the
detective in what has to be the most
chaotic super store ever built with hordes
of harassed housewives doing their
weekly shopping. And you just wait till
the late-night shopping starts.
CATCHA SNATCHA features smooth
Hi-Res multicoloured graphics, sound,
multiple playfields and a real time clock.
100% machine code. Keyboard or
joystick.
Game design and software by
Eugene Evans.
for any Commodore Vic-20.
Ah diddums
for any ZX SPECTRUM.
Are you just the average teddy.
Are you teddy enough to
take on the terrors of the
toybox in an epic struggle to fulfill your
true role in life – to reach and comfort your
crying baby? To boldly go where no teddy
has gone before. To overcome incredible
odds, to take on and fight the clockwork
soldiers, the mammah dolls, the train set, the
play people, and the murderous plastercine.
With only the bear essentials – your
wellington boot, your beachball and faithful
old peashooter – for your defence and your
only ally the Jack in the Box, you will need
to build stairways from the play bricks
around you to reach your baby without
getting the stuffing knocked out of you.
AH DIDDUMS features multiple
toyboxes with progressive difficulty
levels, super cute – super detailed
animation, sound and those fast
smooth graphics that only
IMAGINE can produce.
100% machine code.
Game design
and software by
D. H. Lawson.

THERE IS NO ESCAPE

FRANTIC
for any VIC-20

MISSION: To
excavate and mine the
many moons of Spectum.
To research and destroy the
many alien life forms present.
METHOD: GEO-GRAVITATIONAL
MINING.

Your visor shows a visually bre
view, a near blurr of speed a
towards the centre of the
pulled through by the d
with only a standard
withhold the pull.
The above vide
mere TV mes
which you
formida
the h
for



Any of these games for just

£5.50 EACH

including first class post, packing, VAT and an UNCONDITIONAL LIFETIME GUARANTEE

When you buy Imagine Software you buy it for life. If an Imagine Software product EVER fails to load first time simply return it to Imagine for an instant free replacement.

All orders despatched by first class post within 24 hours of receipt. Subject to stock availability.

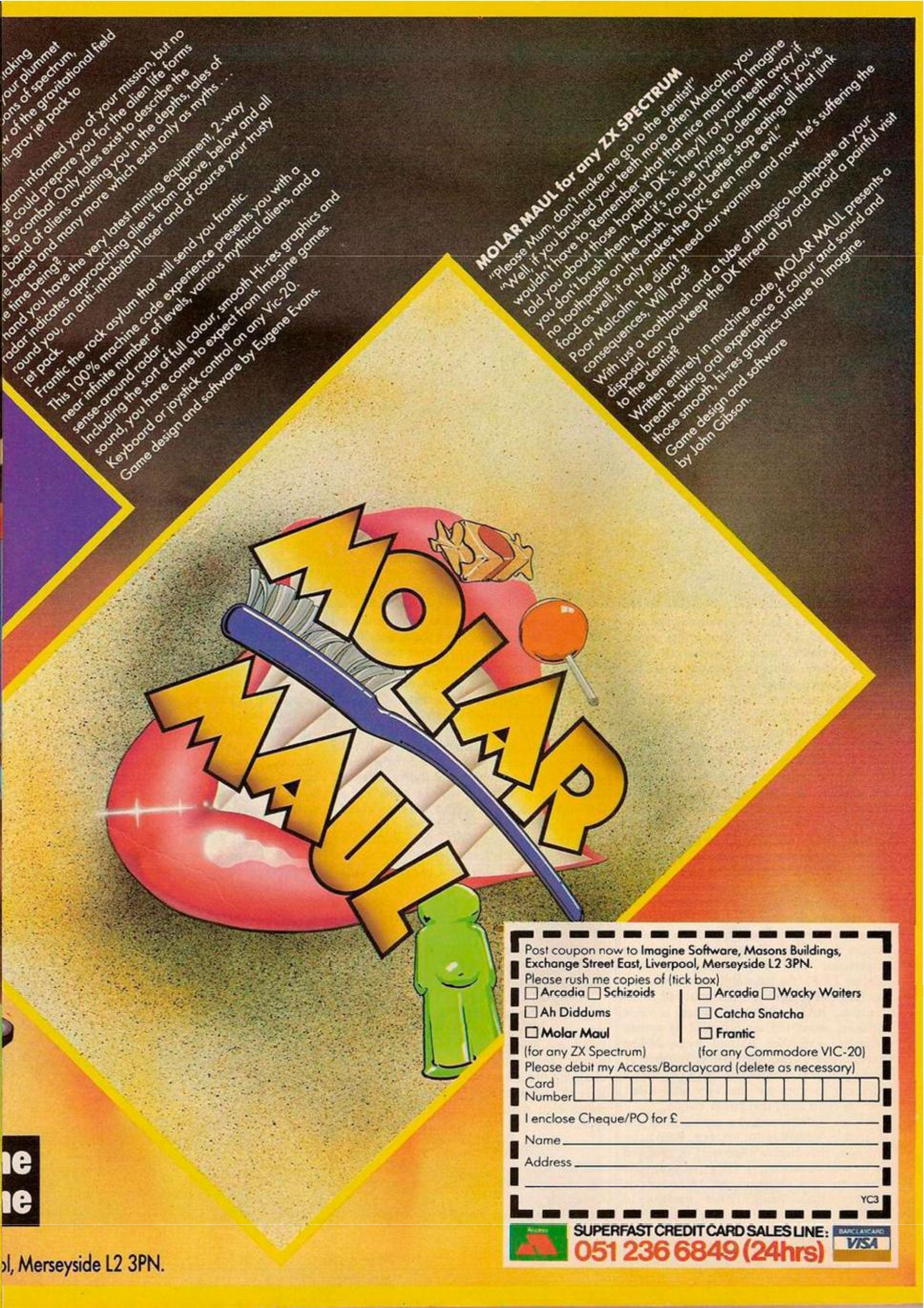
Why not put a first class stamp on your envelope and you will receive your order within 3 days of posting. Available from W.H. Smiths, Boots, Laskys and all good software outlets.

Imagine

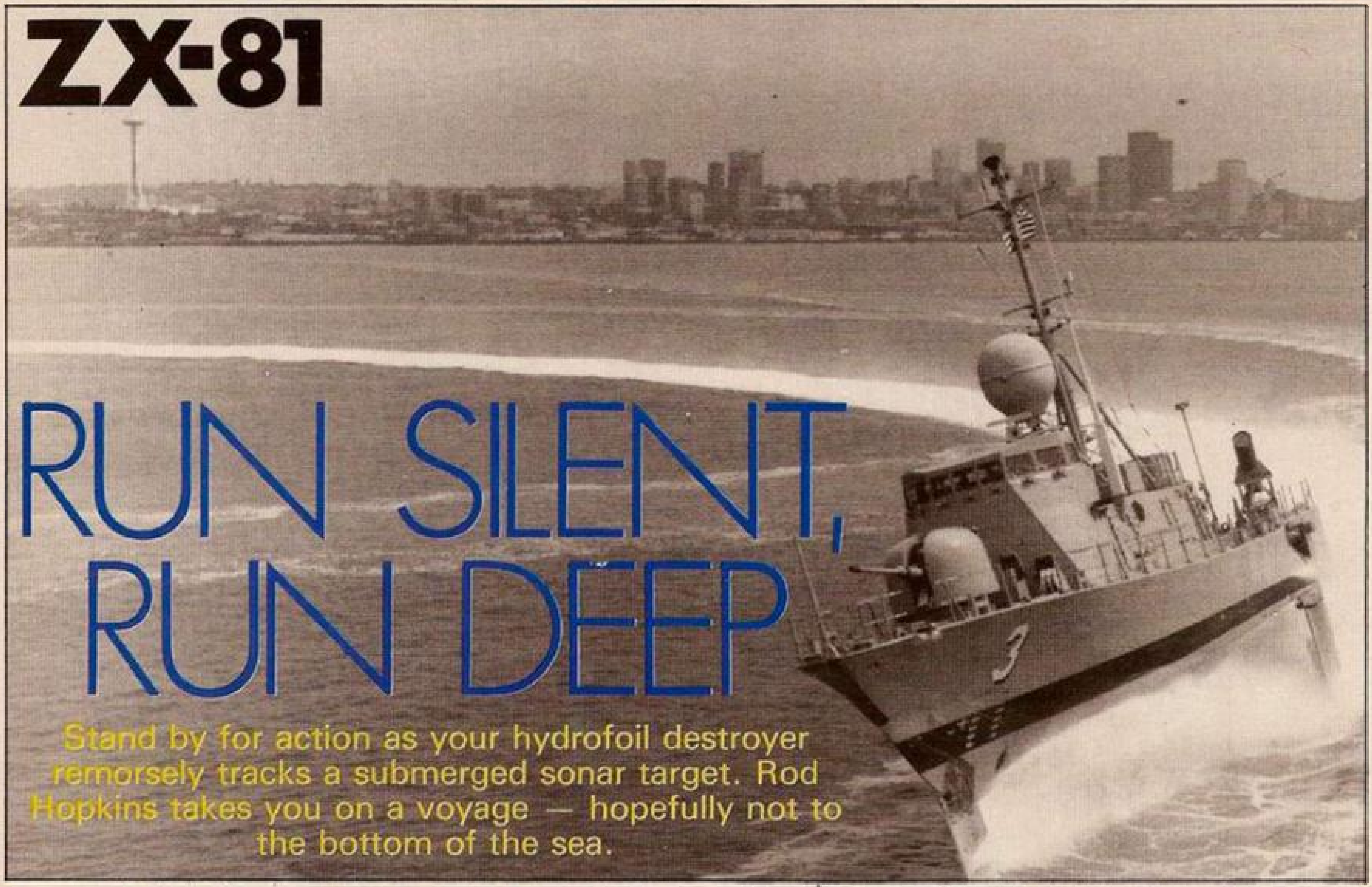
..the nan of the gar

Dealership enquiries contact: Mark Butler

Imagine Software, Masons Buildings, Exchange Street East, Liverpo


...aking
...our plummet
...ons of spectrum,
...w of the gravitational field
...i-grav jet pack to
...gram informed you of your mission, but no
...ge could prepare you for the alien life forms
...e to combat Only tales exist to describe the
...band of aliens awaiting you in the depths, tales of
...-beast and many more which exist only as myths . . .
...e time being?
...hand you have the very latest mining equipment, 2-way
radar indicates approaching aliens from above, below and all
round you, an anti-inhabitant laser and of course your trusty
jet pack.
Frantic the rock asylum that will send you frantic.
This 100% machine code experience presents you with a
near infinite number of levels, various mythical aliens, and a
sense-around radar.
Including the sort of full colour, smooth Hi-res graphics and
sound, you have come to expect from Imagine games.
Keyboard or joystick control on any Vic-20.
Game design and software by Eugene Evans.
MOLAR MAUL for any ZX SPECTRUM
"Please Mum, don't make me go to the dentist!"
"Well, if you brushed your teeth more often Malcolm, you
wouldn't have to. Remember what that nice man from Imagine
told you about those horrible DK's. They'll rot your teeth away if
you don't brush them. And it's no use trying to clean them if you've
no toothpaste on the brush. You had better stop eating all that junk
food as well, it only makes the DK's even more evil."
Poor Malcolm. He didn't heed our warning and now he's suffering the
consequences. Will you?
With just a toothbrush and a tube of Imagico toothpaste at your
disposal, can you keep the DK threat at by and avoid a painful visit
to the dentist?
Written entirely in machine code, MOLAR MAUL presents a
breath-taking oral experience of colour and sound and
those smooth, hi-res graphics unique to Imagine.
Game design and software
by John Gibson.
MOLAR MAUL
Post coupon now to Imagine Software, Masons Buildings,
Exchange Street East, Liverpool, Merseyside L2 3PN.
Please rush me copies of (tick box)
☐ Arcadia ☐ Schizoids
☐ Ah Diddums
☐ Molar Maul
(for any ZX Spectrum)
☐ Arcadia ☐ Wacky Waiters
☐ Catcha Snatcha
☐ Frantic
(for any Commodore VIC-20)
Please debit my Access/Barclaycard (delete as necessary)
Card Number
I enclose Cheque/PO for £
Name
Address
YC3
SUPERFAST CREDIT CARD SALES LINE:
051 236 6849 (24hrs)
...ne
...ne
...ol, Merseyside L2 3PN.

RUN SILENT, RUN DEEP



Stand by for action as your hydrofoil destroyer remorsely tracks a submerged sonar target. Rod Hopkins takes you on a voyage — hopefully not to the bottom of the sea.

A DESTROYER LURKS on a storm-tossed sea, lying in wait for passing submarines — the object, of course, being to destroy one. This game has been written in machine code, and uses imaginative display.

The first and most obvious benefit accruing from the use of machine code is that of speed of execution. Basic is a general-purpose, high-level language designed to cope with an infinite variety of programming needs. A machine-code programmer, on the other hand, can confine his attention to the particular needs of the moment. The result is that a lot of time-consuming classification of tasks, of fetching and carrying can be avoided. A Basic program is ultimately performed as a machine-code sequence of course, but an awful amount of sorting and organising must be carried out by the interpreter during its execution.

A second, and directly-related advantage to be gained from writing in code is that of compactness. This factor is of overriding importance when programming the unexpanded ZX-81, for the simple reason that the machine can arrogate to itself nearly all of the available RAM. Of 1024 bytes of user memory, about 125 are occupied by system variables; a further 700-odd by a 22-line display, and a smallish, variable number by stacks and marker bytes. You will not need a calculator to work out that very little is left over for controlling that power station.

Sinclair sidestepped the problem of the insatiable demands of screen RAM by arranging that display RAM only be allocated as it was demanded, a CLS reducing this allocation to a minimum of 25 end-of-line markers. Basic being rather wasteful of memory, programmers in that language for the 1K machine are forced to make constant use of this facility to contract the display file.

The technique is this: to clear the screen each program cycle and reprint the display, in order that unused but opened display lines should not accumulate an overhead of wasted RAM. Economy results, but unfortunately with a fairly paralysing strobe-effect. In machine code, a sufficiency of display RAM can be permanently opened, and the display given a feel of continuity and fluidity. Naturally, if enough memory were to hand, and a fast interpreter, then the pros and cons would need to be reargued.

For the current program, a decimal dump is provided in figure 1, disassembled in figure 2. It will be noted that some use of Sinclair's ROM has been made.

The first address shown in the dump is 16514, indicating that the code is to be stored in a Rem statement occupying the first Basic line of the program. Therefore, type:

```
1 REM 110 CHARACTERS . . .
```

whichever you like.

Having done this, type

```
PRINT PEEK 16511
```

the result should be 112. If it is not, then edit line 1 and delete or add characters as appropriate. Once line 1 is correct, edit it twice, changing the line number to 2 and 3 respectively. You should now have three Rem statements each containing 110 characters. Now type:

```
POKE 16511,88
POKE 16512,1
```

and in effect, a single Rem statement having 342 characters remains. The stage is now set for entering the machine code. To prevent an unbreakable listing loop occurring after the code has been entered, the two first characters Poked will be Newlines, or end-of-line markers. This has the effect that the default list line will always be line one. However, to list subsequent lines, simply type List 2. Remember to delete the loader when entering has been completed.

Typing in the code using the loader of figure 4 should not take more than about 10 or 15 minutes, forbidding though the dissassembly looks. As bytes are entered, the format of figure 1 is reproduced on the screen to allow straightforward checking of each entry as it is made.

Figure 3 lists the massive Basic part of the program. Do not be tempted to add frills; they

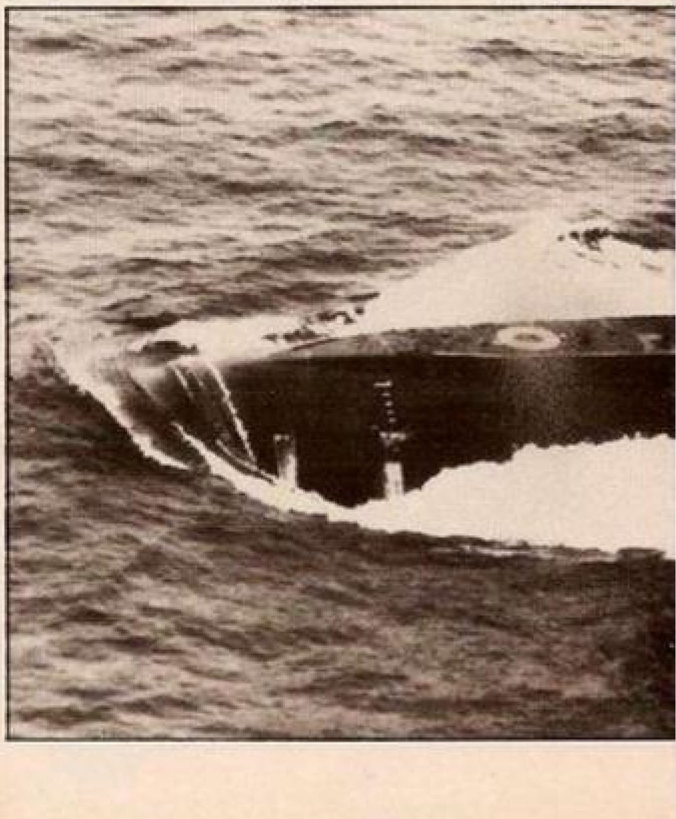


Figure 1.

16514	118	110	42	12	64
16519	229	17	7	0	25
16524	34	14	64	6	64
16529	175	215	16	253	6
16534	32	62	10	215	16
16539	253	1	0	1	175
16544	215	11	120	177	32
16549	249	225	30	51	25
16554	34	60	64	205	135
16559	65	62	255	50	70
16564	64	42	123	64	35
16569	34	123	64	126	33
16574	70	64	52	35	230
16579	7	60	60	50	62
16584	64	198	7	119	71
16589	14	26	205	245	8
16594	42	14	64	34	64
16599	64	22	0	0	0
16604	42	64	64	229	6
16609	5	113	35	16	252
16614	225	43	34	64	64
16619	126	254	118	40	197
16624	6	5	54	131	35
16629	16	251	43	43	43
16634	54	174	58	52	64
16639	230	30	79	6	8
16644	205	245	8	42	14
16649	64	22	0	126	254
16654	10	62	10	32	1
16659	61	119	6	2	197
16664	42	60	64	58	37
16669	64	254	247	32	12
16674	43	126	254	118	40
16679	29	34	60	64	205
16684	135	65	254	239	32
16689	17	35	229	30	7
16694	25	126	254	118	225
16699	40	9	34	60	64
16704	205	135	65	193	16
16709	209	24	2	24	146
16714	237	75	66	64	42
16719	68	64	203	65	32
16724	18	42	60	64	30
16729	36	25	58	37	64
16734	254	253	32	21	12
16739	58	62	64	71	114
16744	30	33	25	16	3
16749	12	24	7	126	254
16754	174	54	52	40	60
16759	237	67	66	64	34
16764	68	64	6	60	13
16769	32	253	16	251	24
16774	193	1	118	7	30
16779	33	42	60	64	229
16784	229	43	126	185	40
16789	5	114	167	237	82
16794	114	225	62	128	119
16799	35	16	252	126	165
16804	40	1	114	225	167
16809	237	82	54	135	35
16814	54	130	35	114	201
16819	1	23	52	42	64
16824	64	43	113	35	54
16829	39	35	112	35	112
16834	35	54	50	35	113
16839	1	0	0	205	245
16844	8	237	75	70	64
16849	6	0	201		

will almost certainly lead to an out of memory report.

Keyboard decoding has been arranged to suit the destroyer skipper wearing regulation Arctic-issue mittens: any key 1 through 5 will move the ship left, while any key 6 to 0 will move it to the right. Pressing F releases a depth charge. As normal, these devices are set to trigger at the supposed depth of the submarine. This particular destroyer has excellent sonar; its charges always go off at the appropriate depth. They must, however, drop into the conning tower to produce the desired effect. To alter the speed at which events take place, try Poking different values into address 16767.

Figure 2.

```
U-BOAT HUNT DISSASSEMBLY

INITSCRN    LD HL,
            (DISPLAY FILE)
            PUSH HL
            LD DE,7
            ADD HL,DE
            LD(DFCC),HL
            LD B,64
ZEROACC     XOR A
            RST 10H
            DJNZ ZEROACC
            LD B,4
            LD A,CODE "■"
PRTACC      RST 10H
            DJNZ PRTACC
            LD BC,256
BLANKLNS    XOR A
            RST 10H
            DEC BC
            LD A,B
            OR C
            JR NZ,BLANKLNS
INITSHIP    POP HL
            LD E,51
            ADD HL,DE
            LD(SHIPAD),HL
            CALL PRTSHIP
            LD A,255
            LD(SUBCOUNT),A
NEWSUB      LD HL,(RAND)
            INC HL
            LD(RAND),HL
            LD A,(HL)
            LD HL,SUBCOUNT
            INC (HL)
            INC HL
            AND 7
            INC A
            INC A
            LD(SUBLINE),A
            ADD 7
            LD(HL),A
            LD B,A
            LD C,26
            CALL PRTPOS
            LD HL,(DFCC)
            LD(SUBAD),HL
PRTSUB      LD HL,(SUBAD)
            PUSH HL
            LD B,5
            LD(HL),C
            INC HL
            DJNZ -4
            POP HL
            DEC HL
            LD(SUBAD),HL
            LD A,(HL)
            CP NEWLINE
            JRZ NEWSUB
            LD B,5
            LD(HL),CODE "■"
            INC HL
            DJNZ -5
            DEC HL
            DEC HL
            DEC HL
            LD(HL),CODE "■"
WAVES       LD A,(FRAMES)
            AND 30
            LD C,A
            LD B,8
            CALL PRTPOS
            LD HL,(DFCC)
            LD D,0
            LD A,(HL)
            CP "■"
            LD A,CODE "■"
            JR Z,1
            DEC A
            LD(HL),A
MOVESHIP    LD B,2
ACTION?     PUSH BC
            LD HL,(SHIPAD)
            LD A,(LAST-K)
LEFT ?      CP 247
            JR NZ,RIGHT ?
            DEC HL
            LD A,(HL)
            CP NEWLINE
            JR Z,DCHARGE
            LD(SHIPAD),HL
            CALL PRTSHIP
RIGHT ?     CP 239
            JR NZ,DCHARGE
            INC HL
            PUSH HL
            LD E,7
            ADD HL,DE
            LD A,(HL)
            CP NEWLINE
            POP HL
            JR Z,DCHARGE
            LD(SHIPAD),HL
            CALL PRTSHIP
            POP BC
            DJNZ ACTION?
            JR DCHARGE
JUMP        JR PRTSUB
DCHARGE     LD BC,(DCIND)
            LD HL,(DCAD)
            BIT 0,C?
            JR NZ,BLANKDC
            LD HL,(SHIPAD)
            LD E,36
            ADD HL,DE
            LD A,(LAST-K)
DCHARGE?    CP 253
            JR NZ,STODC
            INC C
            LD A,(SUBLINE)
            LD B,A
BLANKDC     LD(HL),D
            LD E,33
            ADD HL,DE
            DJNZ PRTDC
            INC C
            JR STODC
PRTDC       LD A,(HL)
            CP CONNINGTOWER
            LD(HL),CODE "O"
            JR Z,EXIT
STODC       LD(DCIND),BC
            LD(DCAD),HL
DELAY       LD B,MAINCOUNT
LOOP        DEC C
            JR NZ,LOOP
            DJNZ LOOP
            JR JUMP
PRTSHIP     LD BC,NEWLINE
            /SHIPLEN
            LD E,LINEINC
            LD HL,(SHIPAD)
            PUSH HL
            PUSH HL
            DEC HL
            LD A,(HL)
            CP C
            JR Z,5
            LD(HL),D
            AND A
            SBC HL,DE
            LD(HL),D
            POP HL
            LD A,CODE "■"
PRTBLK      LD(HL),A
            INC HL
            DJNZ PRTBLK
            LD A,(HL)
            CP C
            JR Z,1
            LD(HL),D
            POP HL
            SBC HL,DE
            LD(HL),"■"
            INC HL
            LD(HL),"■"
            INC HL
            LD(HL),D
            RET
EXIT        LD BC,*/O
            LD HL,(SUBAD)
            DEC HL
            LD(HL),"*"
            INC HL
            LD(HL),"B"
            INC HL
            LD(HL),"O"
            INC HL
            LD(HL),"O"
            INC HL
            LD(HL),"M"
            INC HL
            LD(HL),"*"
            LD BC,0
            CALL PRTPOS
            LD BC,(SUBCOUNT)
            LD B,0
            RET
```

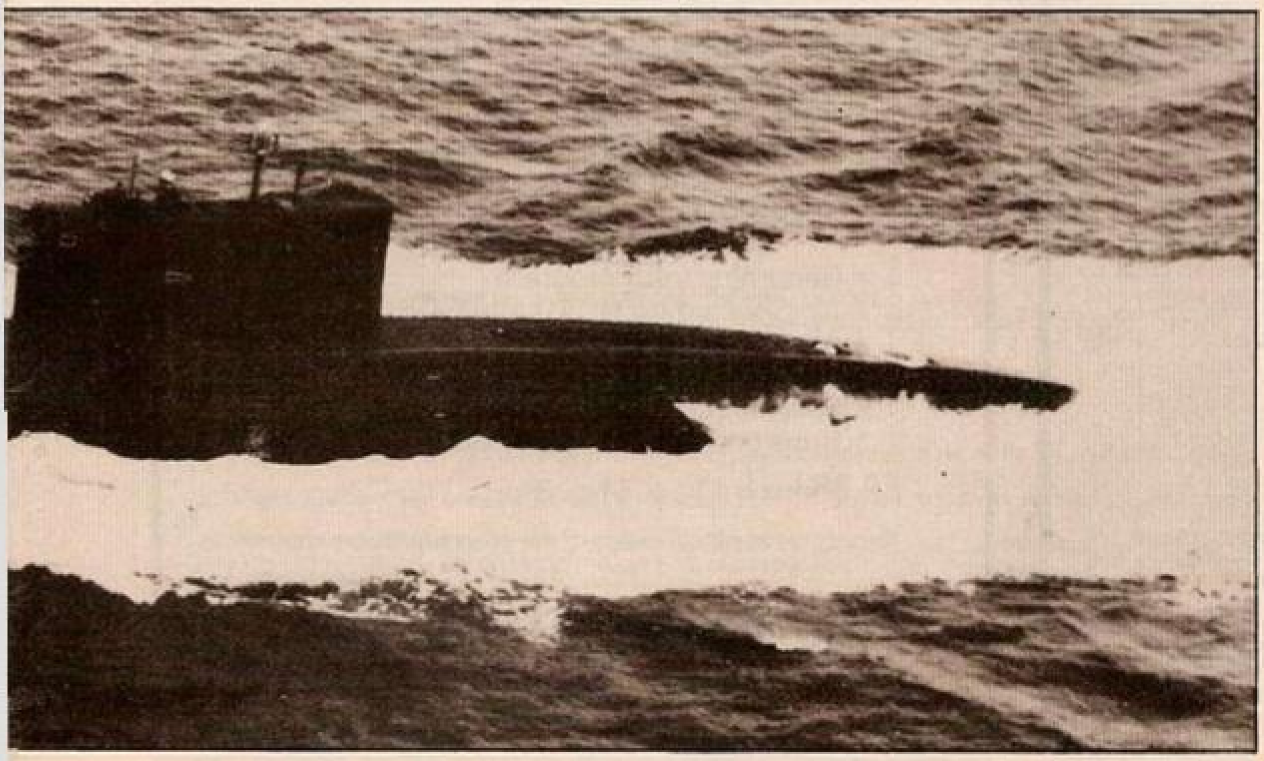


Figure 3.

```
BASIC PROGRAMME
10 PRINT USR 16516;
   "  SUBS ESCAPED"
15 INPUT A$
20 RUN
```

Figure 4.

```
LOADER ROUTINE
10 FOR N=1 TO 338 STEP 5
15 SCROLL
20 PRINT 16513+N;
25 FOR K=0 TO 4
30 INPUT I
35 POKE 16513+N+K,I
40 PRINT TAB (7+K*5);I;
45 IF N+K=338 THEN STOP
50 NEXT K
55 PRINT
60 NEXT N
```

■

J.K. GREYE ENTERPRISES LTD



... is a new company, from J.K. Greye, set up specifically to bring you High Quality/Low Cost games for your Sinclair ZX Computers.

THE ARCADIAN

4 Games plus Menu

for the 16/48k SINCLAIR ZX SPECTRUM

only £4.95 incl.

Includes

Invasion · Kamikaze

Minefield · UFO

Games as sold elsewhere for £5 + each, why pay more for less, when you can get all four for the price of one!

The **ARCADIAN** includes games to suit all ages, from 5 to 105

INVASION: Our version of the Classic Arcade Game, surely one of the best around. Includes Full Colour High Res. Graphics, Sound and it's incredibly fast at the end.

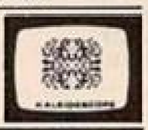
KAMIKAZE: If you like Scramble, you'll love this. 16 levels (long ones at that), of tortuously twisting caverns, Missiles, Starmines (which move in between games, so it's never the same next time around), Bases, Fuel Dumps (watch you don't run out of fuel!), and two speeds (difficult and impossible). Definitely a game for those amongst you with a suicidal tendency, when playing games, because you can score even when you crash! (If you can make it past level 8, write and let us know, 'cause that's as far as we've managed!).

MINEFIELD: A totally new game, in which you have to lay mines in a forest. Sounds simple doesn't it? But, once you start, you can't stop and there lies the rub (or to be more exact the explosion!). Guaranteed to get your fingers in a twist!

UFO: Dodge the Asteroids, blast the Alien Craft and work off your aggressive instincts on the keyboard. Gets progressively more difficult the longer you last!

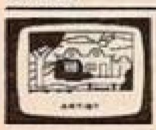
All of these for only £4.95, can you afford to miss out on this one!

ZX81 GAMESTAPES as previously sold by J.K.Greye Software ltd.



GAMESTAPE 1 for 1K ______ only £3.95
10 Games incl. ASTEROIDS, UFO, CODE, BOMBER, GUILLOTINE, KALIEDESCOPE, etc.
PROBABLY THE BEST VALUE 1k TAPE AVAILABLE.

We've done in 1k, games which some of our competitors require 16k to do!



GAMESTAPE 2 for 16K ______ only £3.95
★ **STARFIGHTER** Superb machine code Space Battle, Set against a background of twinkling stars, with stunning explosions — if you can hit the enemy!

PYRAMID Can you move the Pyramid? Make a mistake and it will collapse! A thinkers game.

ARTIST The ultimate Graphic Designers aid. 8 Directions, 10 Memories, SAVE, COPY, RUBOUT, CLS, etc.



GAMESTAPE 3 for 16K ______ only £4.95
★ **CATACOMBS** A Multi-Level Graphics Adventure. Each level can contain up to 9 Rooms, 8 Passages, 7 Monsters, Food, Gold, Traps, Phantoms, an Exit (to the next level), and there's an infinite number of levels.
NOTE ....This is NOT one of the necessarily limited text Adventures as sold elsewhere.
"An excellent addictive game which will keep you amused for hours" ....COMPUTERS & VIDEO GAMES.

Send your order to: **J.K.GREYE ENTERPRISES LTD. 16 Park St. Bath BA1 2TE**

Please tick boxes of required tapes.

The ARCADIAN at £4.95 ☐
GAMESTAPE 1 at £3.95 ☐
GAMESTAPE 2 at £3.95 ☐
GAMESTAPE 3 at £4.95 ☐

All Software sold subject to the condition that Hiring, Lending, Unauthorised Copying or Resale is Strictly Prohibited

Name ....

Address ....

.... Postcode ....

I enclose a cheque/P.O. for £ ....
made payable to **J.K. GREYE ENTERPRISES LTD.**

TRADE & EXPORT ENQUIRIES WELCOME

PROGRAMMERS! Do you think you can write brilliant games Software for the spectrum? If so, contact us and we'll market it for you. If you don't think your games are the best around, try the other Software Houses, because we will only sell the best!

If you prefer to see before buying, our range of Gamestapes are stocked by W.H.Smith, John Menzies and good computer stores Nationwide

SINCLAIR OWNERS READ THIS FROM OCP

You've probably heard about MACHINE CODED PROGRAMS and thought "so what! How can they *help me?*"

Well now you can find out and taste the very real difference by purchasing our latest MACHINE CODED programs. These emulate features of the most modern professional computers (12 years writing machine coded programs for IBM, ICL, UNIVAC and Sinclair means we know what we're talking about).

Just read the specification and you'll see what we mean.

MACHINE CODE TEST TOOL

The ultimate professional tutor and de-bug program, we wrote this to help us write our own programs.

- **TEST** and display machine code instructions as they're written.
- **IDEAL** for both the novice and the expert.
- **FULLY** documented with a 32 page tutorial
- **HEX:DECIMAL** conversion as standard.
- **CHARACTER GENERATOR** — of unbelievable quality
Supplied free with the Spectrum version.

Available for the 16K ZX81 and 16/48K Spectrum.

SPECTRUM CHESS Dare you face The Turk

The original Turk was an eighteenth century automaton, a life-size mechanical figure resplendent in Turkish costume and seated behind a wooden cabinet on which a chess board and pieces were placed.

OCP now offer you the twentieth century equivalent of that Turk — a chess-playing computer program.

The Turk challenges you to a game of chess!



MANY OPTIONS INCLUDE:

- 6 LEVELS OF DIFFICULTY
- DEMONSTRATION MODE
- BOARD EDITOR
- GAMES PRINTOUT FACILITY
- BLITZ CHESS AGAINST THE CLOCK
- TWO PLAYER MODE
- UNFINISHED GAMES CAN BE STORED
- RECOMMENDED MOVE

FULL INSTRUCTIONS PROVIDED

ADDRESS MANAGER.....

Works on the 16K and 48K Spectrum, in 48K it will store, file, select and retrieve over 400 full addresses (over 1500 individual names); Dynamic Memory Management and compression techniques makes all this possible and there's a lot more:

- **FULL SCREEN INPUT and EDITING** — see it as a page as it happens with insert, delete and TAB Commands.
- **MULTIPLE INDEXING** — 3 way user-defined index enables you to define, catalogue, select and print entries as needed, (essential for the more sophisticated applications.)
- **INSTANT RESPONSE** — yes, this program is very very fast.
- **SUPER FRIENDLY** — crash-proof, extremely easy to use and efficient in a way that BASIC can never be.

MANY USES

- **AT HOME** — (storing addresses, printing out Xmas Card lists etc.)
- **AT WORK** — for mail-order work, internal telephone directory, sorting customers into types, areas, size ... you choose.
- **CLUBS** — print-out members list, sort different categories etc.

MACHINE CODE.. IT MAKES ALL THE DIFFERENCE.....

Post order to: Oxford Computer Publishing Ltd., P.O. Box 99, Oxford.

Please rush me: **Address Manager** at £8.95 each. ☐Spectrum only.
Chess The Turk at £8.95 each. ☐Spectrum only.
Machine Code Test Tool at £9.95 each.

Tick box for edition required: ☐ZX81 ☐Spectrum

Send cheque, postal order or ACCESS No. to above address. Or telephone order with ACCESS No. to (0753) 888866

NAME ....

ADDRESS ....

.... POSTCODE ....

Available from most branches of **W H SMITH** and other retailers.

OCP

THE PROFESSIONAL APPROACH TO

SPECTRUM

SOFTWARE

We are a well established software company expanding into the field of Personal Computing.

ENHANCE YOUR BASIC

Now available BASIC toolkit includes:

- Add logical arithmetic functions (AND, NOT, OR, XOR)
- List all BASIC variables and arrays
- Speed up your games with our fast screen output.
- Renumber your program (including GOTO and GOSUB)
- All routines in machine code
- Easily called from BASIC
- Fully documented
- Runs on 16K and 48K SPECTRUM

£9.95 inc VAT (+ £1 p. & p.)

To order or to obtain details of our other products contact:

Malva Ltd.

**70 ASHCHURCH DR.
WOLLATON
NOTTINGHAM
NG8 2RA**

REAL TIME SOFTWARE SPECIALISTS

BREAK THROUGH THE BBC OPERATING SYSTEM



The Breakout program.

```
 10NERROR RUN
  10*TV255,0
  20MODE7
  30 PROCSETUP
  40PROCCOURT
  50CALLPIP
  60PRINTTAB(24,0);!S%;:IF?BC<54 AND?BY<21 GOTO50
  70TIME=0:REPEAT SOUND &12,-8,TIME,5: UNTIL TIME>200
  80SOUND&11,-15,0,5:IF ?BC=54 ?XV=?XV *(2*RND(2)-3):?YV=255:GOTO40
  90?YV=0-ABS(?YV):BL%=BL%-1:PRINTTAB(37,0);BL%
 100IF BL%>0 ?XV=ABS(?XV):GOTO50
 110 IF !S%>HI_SCORE HI_SCORE=!S%
 120PRINTTAB(3,16)CHR$133"HIT 'G'-ANOTHER GAME  OR"CHR$151;TAB(2,17)CHR$134"'ES
CAPE'-START FROM BEGINNING"CHR$151;
 130IF NOT INKEY(-84) GOTO130
 140?XV=(2*RND(2)-3):?YV=255:?WS=1:BL%=BALLS%:!(S%)=0:GOTO40
 150DEF PROCCOURT:LOCAL I%,J%
 155CLS
 160IF ?WS<11 AND ?BC=54 ?WS=?WS+2
 170CLS:PRINT:FOR I%=0 TO 22:PRINTCHR$152:NEXT
 180PRINTTAB(1,1)STRING$(38,CHR$112)
 190
 200FORI%=2 TO23:PRINTTAB(1,I%)CHR$181;TAB(38,I%)CHR$234;:NEXT
 210FORI%=?WS+2 TO ?WS+7:PRINTTAB(2,I%)STRING$(36,CHR$124):NEXT
 220FORI%=1 TO ?WS +1:PRINTTAB(0,I%)CHR$151:NEXT
 230RESTORE:FOR I%=1 TO 6:READJ%:PRINTCHR$J%:NEXT
 240REPEAT:PRINTCHR$151:UNTIL  VPOS=23
 250 DATA147,150,146,149,145,148
 260T%=RND(15)+2
 270?BC=0:?BP=19:?PB=39:?DB=1:PRINTTAB(19,21);CHR$42;STRING$(?BL-1,CHR$47);CHR$
37
 280?BX=T%:?LX=T%:?BY=20:?LY=20:?PX=T%*2:?PY=60:?DX=0:?DY=0:PRINTTAB(T%,20)CHR$
33
 290PRINTTAB(1,0)CHR$131;"HI_Score:";CHR$135;HI_SCORE;TAB(16,0)CHR$133;"Score:"
;CHR$134;!S%;TAB(29,0);CHR$130;"Balls:";CHR$131;BL%
 300REPEAT UNTIL INKEY(-99)
 310ENDPROC
 320DEF PROCSETUP
 330OSWORD=&FFF1:OSWRCH=&FFEE:OSBYTE=&FFF4
 340VDU23;8202;0;0;0;
 350DIM DOT 5,T1 0,T2 0,T3 0,T4 0,BX 0,BY 0,PX 0,PY 0,XV 0,YV 0,BP 0,PB 0,BL 0,
```

(listing continued on page 83)

BBC

Chris Melville's last two articles delved into the BBC operating system — now you can break out.

THE PROGRAM published here is a Basic-driven assembly language program to play either Breakout or Breakthrough. It uses pixel graphics in Mode 7 so that it should run on a model A if you miss out all the comments and put multiple assembler statements per line. Using pixels in mode 7 needs some fiddling which would slow down a Basic program too much to make a challenging game, but this one is both fast and smooth. It was intended as an example of how the MOS calls would be used in games programming. There is not a direct memory reference in the whole program — unusual for a game — so the program will run on any operating system and also with the 6502A second processor installed. The features are: selectable bat size, increasing game speed as score increases, selectable initial hardness, selectable bat speed relative to ball, selectable number of balls per game, wall lowers every time you get through the last one, breakout or breakthrough, and high score.

Some of the operating system calls are as follows:

Purpose	Line numbers	MOS routine
Produce a beep	680-710	OSWORD(7)
Perform Tab	950-1000	OSWRCH(31)
Examine character at cursor position.	1020-1030	OSBYTE(135)

(continued on page 83)

(listing continued from page 81)

```
BV 0,BC 0,BEEP 8,WS 0,S% 3,DX 0,DY 0,DB 0,LX 0,LY 0,SPEED 0,THRU 0,LEVEL 15
  360?DOT=161:?(DOT+1)=162:?(DOT+2)=164
  370?(DOT+3)=168:?(DOT+4)=176:?(DOT+5)=224
  380!(BEEP)=&FFF10011:!(BEEP+4)=&5000F
  390?SPEED=30:!S%=0:?WS=1:?XV=1:?YV=255
  400PITCH=BEEP+4:HI_SCORE=0
  410 PROCASSEMBLE
  420PROCINSTRUCTIONS
  430ENDPROC
  440DEF FNGETBETWEEN(I%,J%):LOCAL K%
  450 PRINT" (";I%;" to ";J%;")";CHR$135;
  460REPEAT:K%=GET-ASC"0":UNTIL K%>=I% AND K%<=J%
  470PRINTCHR$(K%+ASC"0")
  480=K%
  490DEF PROCINSTRUCTIONS:CLS
  500CLS:PRINT''CHR$131;"B R E A K O U T        C.MELVILLE '83"
  510PRINTCHR$145;STRING$(15,"\");SPC(9);STRING$(15,"\")
  520PRINT'CHR$134;"Input no. of balls per game ";:BALLS%=FNGETBETWEEN(1,5):BL%=
BALLS%
  530PRINT'CHR$130;"Input initial bat size";:?BL=FNGETBETWEEN(1,5)
  540PRINT'CHR$133;"Input bat speed ";:?BV=FNGETBETWEEN(1,4)
  550PRINT'CHR$130;"Hit O for breakOUT,T for breakTHROUGH":REPEAT X$=GET$:UNTIL
X$="O" OR X$="T":IF X$="O" ?THRU=0 ELSE ?THRU=255
  560PRINT'CHR$134;"Input initial game speed";:H%=FNGETBETWEEN(1,3)
  570 PRINT''CHR$129;"Z-bat left,X-bat right, SPACE BAR-serve";
 580 PRINT''CHR$136;"       key  to  start ...."
 590 X=GET
  600IF H%=1 !(LEVEL)=&1E23282B:!(LEVEL+4)=&18191A1C:!(LEVEL+8)=&12131416:!(LEVE
L+12)=&080C0F11 ELSE!(LEVEL)=&18191A1C:!(LEVEL+4)=&12131416:!(LEVEL+8)=&080C0F11
:!(LEVEL+12)=&080C0F11
  610IFH%=3 !(LEVEL)=&12131416:!(LEVEL+4)=&080C0F11:!(LEVEL+8)=&080C0F11:!(LEVEL
+12)=&080C0FF11
  620ENDPROC
  630DEF PROCASSEMBLE:LOCAL PASS%
  640DIM FREE%2000
  650FOR PASS%=0 TO 2 STEP2
  660P%=FREE%
  670[ OPT PASS%
  680.PIP  LDX #BEEP MOD 256
  690      LDY #BEEP DIV 256
  700      LDA #7          \SET UP OSWORD
  710      JSR OSWORD      \DO A BEEP
  720.BALL LDA PX          \FIND NEW
  730JSR DELAY
  740      CLC             \PIXEL  POS.
  750      ADC XV          \OF BALL BY
  760      STA PX          \ADDING ON
  770      LDA PY          \X,Y VELOCITY
  780      CLC             \COMPONENTS
  790      ADC YV           \TO  OLD POS.
  800      STA PY
  810
  820      LDA PX          \WORK OUT TAB
  830      LSR A           \POSITION OF
  840      STA BX          \BALL
  850
  860      LDA PY
  870      LDY #255        \WORK OUT TAB
  880.SUB  INY:SEC         \POS. OF Y
  890      SBC #3          \COORD. OF
  900      BCS SUB         \BALL AND ITS
  910      CLC:ADC #3      \PIXEL HEIGHT
920      STY BY          \ABOVE Y-CD.
  930      STA DY
  940
  950      LDA #31         \CODE FOR TAB
  960      JSR OSWRCH
  970      LDA BX          \MOVE TO X,Y
  980      JSR OSWRCH      \POS.OF BALL
  990      LDA BY
 1000      JSR OSWRCH
 1010
 1020      LDA #135        \EXAMINE CHAR
 1030      JSR OSBYTE      \ALREADY HERE
 1040      STX T1          \ + PUT IN T1
 1050
 1060      LDA T1          \SEE IF IT IS
 1070      CMP #112        \PART OF TOP
 1080      BNE SKP1        \WALL,IF SO
 1090      JMP LID         \GO TO "LIC"
 1100
 1110.SKP1 CMP #181        \SEE IF IT IS
 1120      BNE SKP2        \PART OF LEFT
 1130      JMP SIDE        \SIDE WALL...
 1140
 1150.SKP2 CMP #234        \AND SAME FOR
 1160      BNE SKP3        \RIGHT WALL..
1170      JMP SIDE
 1180
 1190.SKP3 CMP #47         \IF IT WAS
 1200      BNE SKK2        \PART OF BAT
 1210      JMP BAT         \GO TO "BAT"
 1220
 1230.SKK2 CMP #42         \ALSO TEST FOR
   BNE SKK1        \A HIT ON THE
 1250      JMP LBAT        \SIDE OF BAT
 1260
-1270.SKK1 CMP #37         \AND OTHER ONE
 1280      BNE SKK3
 1290      JMP RBAT
 1300
 1310.SKK3 LDA BY          \IF BALL HAS
 1320      CMP #21         \GONE OUT,
 1330      BNE SKP4        \RETURN TO
 1340      RTS             \BASIC.
 1350
 1360.SKP4 LDA T1          \SEE IF BALL
 1370      CMP #124        \HAS HIT A
```

```
 1380      BNE SKP5        \BRICK,IF SO
 1390      JMP BRICK       \GOTO"BRICK"
 1400
 1410.SKP5 LDA #31         \MOVE TO TAB
 1420      JSR OSWRCH      \POS. OF LAST
 1430      LDA LX          \POS. OF BALL
 1440      JSR OSWRCH      \AND RUB IT
 1450      LDA LY          \OUT
 1460      JSR OSWRCH
 1470      LDA #ASC" "
 1480      JSR OSWRCH
 1490
 1500      LDA PX          \FIND PIXEL
 1510      AND #1          \INSIDE X-CD.
 1520      STA DX          \OF BALL.
 1530
 1540      CLC:ADC DY      \USE LOOK-UP
 1550      CLC:ADC DY      \TABLE TO
 1560      TAX             \DECIDE WHICH
 1570      LDA DOT,X       \GRAPHICS CHR
 1580      STA T2          \IS REQUIRED.
 1590
 1600      LDA #31         \DO A TAB,AND
 1610      JSR OSWRCH      \PRINT THE
 1620      LDA BX          \GRAPHICS
 1630      JSR OSWRCH      \CHARACTER
 1640      LDA BY          \THAT WAS
 1650      JSR OSWRCH      \WORKED OUT
 1660      LDA T2          \TO REPRISENT
 1670      JSR OSWRCH      \THE BALL.
 1680
 1690      LDA BX:STA LX \SET NEW LAST
 1700      LDA BY:STA LY \COORDINATES.
 1710
 1720\THE NEXT SECTION IS RESPONSIBLE
 1730\FOR SCANNING THE KEYBOARD AND
 1740\MOVING BAT ACCORDINGLY.
 1750
 1760.MBAT LDA #129        \TEST Z,X KEYS
 1770      LDY #&FF        \USING THE OS
 1780      LDX #&BD        \OSBYTE 129
 1790      JSR OSBYTE      \EQUIVALENT OF
 1800      TYA:BMI XGOT \INKEY(-67)
 1810      LDA #129        \OR INKEY(-98)
 1820      LDY #&FF        \AND BRANCH TO
 1830      LDX #&9E        \CORRESPONDING
 1840      JSR OSBYTE      \BAT-MOVING
 1850      TYA             \ROUTINES IF
 1860      BMI ZGOT        \Z,X PRESSED
 1870
 1880.KBD2 JMP BALL \RETURN TO START.
 1890
 1900.XGOT LDA BV:STA T1 \FIND VALUE
 1910      JMP BT1         \TO BE ADDED
 1920.ZGOT LDA #0:SEC      \TO BAT POS.
 1930      SBC BV          \AND STORE
 1940      STA T1          \IT IN T1.
 1950
 1960.BT1  LDA #31         \MOVE TO TAB
 1970      JSR OSWRCH      \POS.OF START
 1980      LDA BP          \OF BAT.
 1990      JSR OSWRCH
 2000      LDA #21
 2010      JSR OSWRCH
 2020
 2030      LDY BL          \NEXT FEW
 2040      LDA #ASC" "     \LINES DEALS
 2050.BT2  JSR OSWRCH      \WITH RUBBING
 2060      DEY:BNE BT2     \OUT OLD BAT.
 2070      LDA DB
```

(continued from page 81)

Perform Tab
Test z and x keys on keyboard 1760-1790 OSBYTE(129)
Printing spaces to rub out bat 2030-2090 OSWRCH

They are repeated at several different places in the program. The assembly code is fully commented so it should be possible to develop the game further if required.

```
 2080      BEQ BT3
 2090      LDA #ASC" ":JSR OSWRCH
 2100
 2110.BT3  LDA PB          \NEXT SECTION
 2120      CLC:ADC T1      \WORKS OUT
 2130      STA T2          \POSITIONAL
 2140      AND #1:STA T3 \DETAILS OF
 2150      LDA T2:LSR A    \NEW BAT AND
 2160      STA T4          \STORES THEM.
 2170
 2180      CLC             \WORK OUT END
 2190      ADC BL          \POS.OF BAT
 2200      CLC             \AND SEE IF
 2210      ADC T3          \TOO FAR TO
 2220      CMP #39         \RIGHT$(IF SO
 2230      BCC BTT         \DO NEXT BIT)
 2240      LDA #38         \MOVE BAT TO
 2250      SEC:SBC BL      \RIGHTMOST
 2260      STA BP          \POSITION
 2270      ASL A:STA PB
 2280      LDA #0:STA DB
 2290      JMP BT4
 2300
 2310.BTT  LDA T4          \HAS BAT HIT
 2320      CMP #2          \WALL AT LEFT
 2330      BCS BTO         \NO-SKIP
 2340      LDA #4:STA PB
 2350      LDA #0:STA DB
 2360      LDA #2:STA BP
 2370      JMP BT4
 2380
 2390.BTO  LDA T2:STA PB \TRANSFER
 2400      LDA T3:STA DB \TO PERMANENT
 2410      LDA T4:STA BP \REGISTERS.
 2420
 2430.BT4  LDA #31         \DRAW BAT AT
 2440      JSR OSWRCH      \POSITION
2450     LDA BP          \GIVEN BY THE
 2460      JSR OSWRCH      \CONTENTS OF
 2470      LDA #21         \THE PERMNT.
 2480      JSR OSWRCH      \REGISTERS.
 2490      LDA DB
 2500      BEQ BT5
 2510      LDA #42:JMP BT6
 2520.BT5  LDA #47
 2530.BT6  JSR OSWRCH
 2540      LDY BL:LDA #47
 2550.BT7  DEY:BEQ BT8
 2560      JSR OSWRCH
 2570      JMP BT7
 2580.BT8  LDA DB
 2590      BEQ BT9
 2600      LDA #37:JSR OSWRCH
 2610.BT9  JMP BALL \RETURN TO START
 2620
 2630
 2640\THE NEXT BIT IS THE ROUTINE FOR
 2650\WHEN THA BALL HITS THE "ROOF"
 2660
 2670.LID  LDA PX:CMP #4:BNE LD0
 2680      LDA PY:CMP #6:BNE LD0
 2690      LDA #0:SEC:SBC XV:STA XV
 2700.LD0  LDA #150         \SET UP PITCH
 2710.LD1  STA PITCH        \TO BE BEEPED
 2720      LDA #0           \NEGATE AND
 2730      SEC:SBC YV       \RE-STORE Y
 2740      STA YV           \COMPONENT OF
 2750      JMP PIP          \BALL VELOITY
 2760
 2770\AND WHEN THE BALL HITS THE SIDE:
 2780
 2790.SIDE LDA #90          \AS BEFORE...
 2800      STA PITCH
 2810      LDA #0
 2820      SEC:SBC XV
 2830      STA XV
 2840      LDA BY
 2850      CMP #21
 2860      BCC SID1
 2870      LDA PB
 2880      CMP #5
 2890      BCC SID2
 2900      JMP SKK3
 2910.SID2 LDA #0:SEC:SBC YV:STA YV
 2920.SID1 JMP PIP
 2930
 2940\AND WHEN THE BALL HITS THE BAT:
 2950
 2960.BAT  LDA XV           \BALL LEAVES
 2970      BMI B1           \MIDDLE OF BAT
```

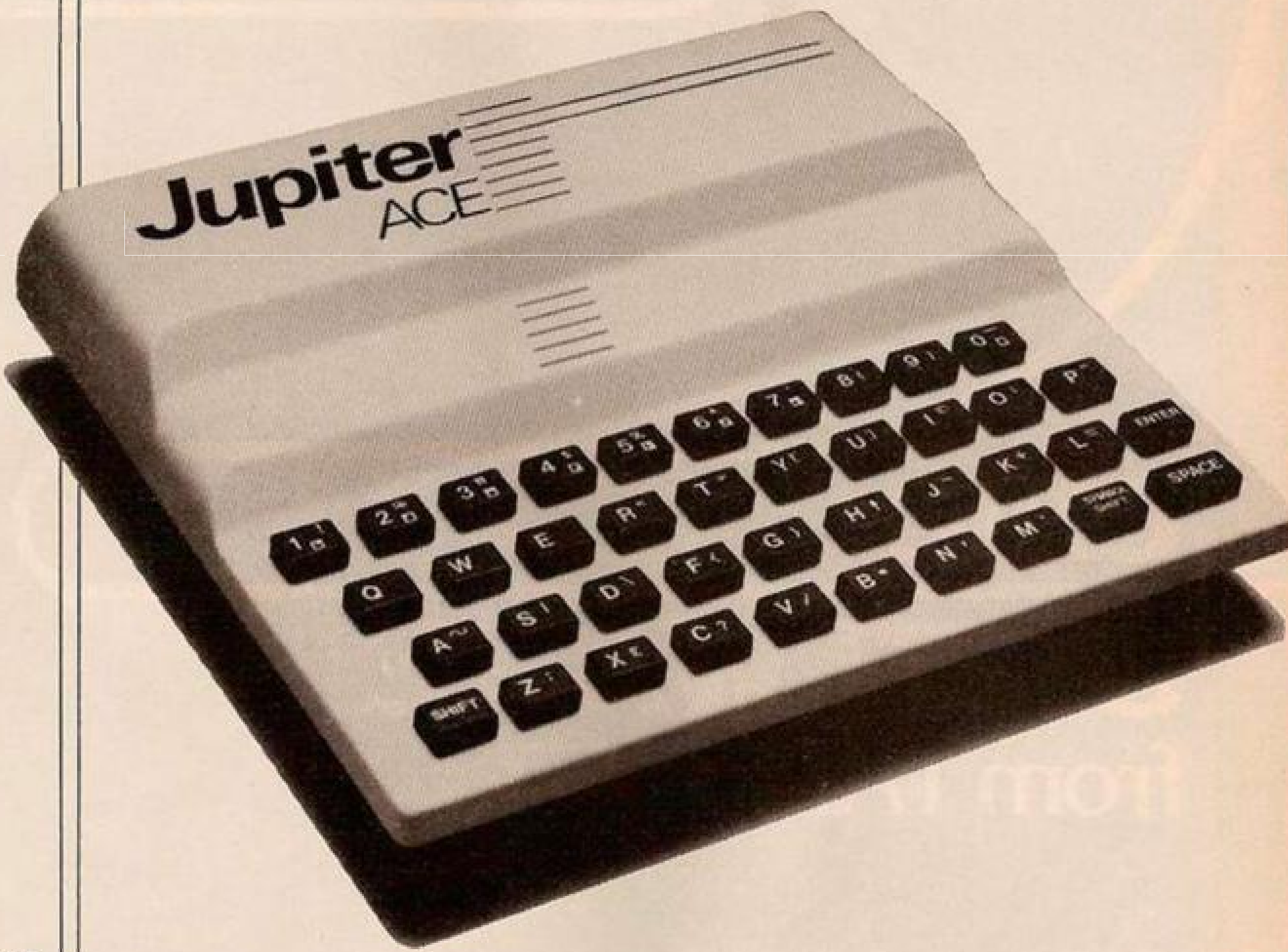
(continued on page 85)

(continued from page 83)

```
2980         LDY #1        \WITH UNIT X
2990         STY XV        \VELOCITY IN
3000         JMP B2        \MAGNITUDE
3010.B1      LDY #255
3020         STY XV
3030.B2      LDA #10
3040         JMP LD1
3050
3060.RBAT LDA #2           \IF BALL HIT
3070         STA XV        \EDGE OF BAT
3080         JMP B2       \DIFFERENT
3090.LBAT LDA #254         \BOUNCING
3100         STA XV        \OCCURS
3110         JMP B2
3120
3130\THE NEXT SECTION DEALS WITH THE
3140\BALL HAVING HIT A BRICK.
3150
3160.BRICK LDA #8          \WORK OUT THE
3170         SEC           \ROW NUMBER
3180         SBC BY        \AND PUT IT
3190         CLC           \IN T1.
3200         ADC WS
3210         STA T1
3220
3230         LDA BX        \NOW WORK OUT
3240         SEC:SBC #2    \THE START
3250         AND #&FC      \POS.OF BRICK
3260         CLC:ADC #2
3270         STA T2        \ =T2
3280
3290         LDA #31       \DO A TAB TO
3300         JSR OSWRCH    \THEBEGINNING
3310         LDA T2        \OF THE BRICK
3320         JSR OSWRCH
3330         LDA BY
3340         JSR OSWRCH
3350
3360         LDA #ASC" "   \NOW BLANK OUT
3370         JSR OSWRCH    \BRICK
3380         JSR OSWRCH
3390         JSR OSWRCH
3400         JSR OSWRCH
3410
3420         LDA T1        \WORK OUT
3430         TAX           \PITCH OFBEEP
3440         ASL A
3450         ASL A
3460         ASL A
3470         ASL A
3480         STA PITCH
3490
3500         TXA               \INCREMENT
3510         CLC:ADC S%        \SCORE AS PER
3520         STA S%            \ROW HIT.
3530         LDA #0            \NOTE-SCORE
3540         ADC S%+1          \IS A 2-BYTE
3550         STA S%+1          \QUANTITY
3560         JSR PRMS          \THIS ROUTINE CHECKS HOW HIGH THE SCORE IS AND
CHANGES THE DIFFICULTY ACCORDINGLY.
3570
3580       LDA THRU            \NEGATE Y-CMP
3590       BMI IBC             \OF VELOCITY
3600         LDA #0            \IF NOT
3610         SEC:SBC YV        \BREAKTHROUGH
3620         STA YV
3630
3640.IBC LDA BC
3650         CLC:ADC #1        \INCREMENT
3660         STA BC            \BRICK COUNT
3670
3680         LDA #0:TAY:TAX:RTS  \RETURN TO BASIC WITH ALL REGISTERS ZERO'D
3690
3700\ THE FOLLOWING SUBROUTINE USES A LOOK UP TABLE CALLED "LEVEL" TO DECIDE
ON THE SPEED OF THE GAME FOR ANY PARTICULAR SCORE LESS THAN 1024
3710.PRMS LDX S%+1             \GET SCOREHIGH
3720         LDY S%            \GET SCORE LOW
3730         TXA:ROR A
3740         TAX:TYA
3750         ROR A:TAY:TXA
3760         ROR A:TAX:TYA
3770         ROR A:TAY
3780         LSR A:LSR A:LSR A:LSR A
3790         TAX:LDA LEVEL,X:STA SPEED:RTS
3800.DELAY PHA:TYA:PHA:TXA:PHA
3810          LDX SPEED
3820.D2       LDY #255
3830.D1       DEY:BNE D1
3840          DEX:BNE D2
3850          PLA:TAX:PLA:TAY:PLA:RTS
3860]
3870NEXT PASS%
3880ENDPROC
```

■

ACES CAN GO FASTER



Forth is fast, but a little bit of machine code will take you through the light barrier. Simon Cross shows you how to accelerate your Jupiter Ace with this handy kit of 10 screen-handling routines for those situations where Forth is still not quite fast enough and the ultimate speed of machine code is what you require.

FILL BACKGROUND

```
( ASCII CODE- )
RST 24        223
LD HL (9216)   33    0    36
LD B (23)       6   23
PUSH BC       197
LD B (32)       6   32
LD A (HL)     126
CP (32)       254   32
JRNZ (+2)      32    2
LD A E        123
LD (HL) A     119
INC HL         35
DJNZ (-10)     16  246
POP BC        193
DJNZ (-16)     16  240
JP (IY)       253  233
```

FILL FOREGROUND

```
( ASCII CODE- )
RST 24        223
LD HL (9216)   33    0 36
LD B (23)       6   23
PUSH BC       197
LD B (32)       6   32
LD A (HL)     126
CP (32)       254   32
JRZ (+2)       40    2
LD A E        123
LD (HL) A     119
INC HL         35
DJNZ (-10)     16  246
POP BC        193
DJNZ (-16)     16  240
JP (IY)       253  233
```

SEARCH& REPLACE

```
( ASCII CODE SEARCH
  ASCII CODE REPLACE- )
RST 24        223
LD C E         75
RST 24        223
LD HL (9216)   33    0    36
LD B (23)       6   23
PUSH BC       197
LD B (32)       6   32
LD A (HL)     126
CP E          187
JRNZ (+2)      32    2
LD A C        121
LD (HL) A     119
INC HL         35
DJNZ (-9)      16  247
POP BC        193
DJNZ (-15)     16  241
JP (IY)       253  233
```

INVERT

```
( - )
LD HL (9216)   33    0    36
LD B (23)       6   23
PUSH BC       197
LD B (32)       6.  32
LD A (HL)     126
ADD A (128)   198  128
LD (HL) A     119
INC HL         35
DJNZ (-7)      16  249
POP BC        193
DJNZ (-13)     16  243
JP (IY)       253  233
```

THE JUPITER ACE offers an alternative for those who wish to write fast arcade games but cannot face the sometimes daunting challenge presented by machine code. The speed advantage that Forth has over Basic enables the games programmer to write "space-invader" type programs without reaching for an assembler. However, there are still some situations where Forth is not quite fast enough and the ultimate speed of machine code is required.

One such situation is writing screen-handling routines such as scrolling. Try this Forth word which fills the screen with a character specified by an ASCII code taken from the top of the stack:

```
: FILL
  9952 9216
  DO
  DUP I C!
  LOOP
  DROP
;
```

Execute this word by typing an ASCII code followed by "fill", for example "42 fill" will produce a screenful of stars. It can be seen that although the screen is filled quite rapidly, the process of printing is visible passing in a wave from the top to the bottom of the screen. When this routine is written in machine code the process appears to be instantaneous; this is useful for creating explosion effects and the like. The difference in speed between Forth and machine code becomes more marked with more complex routines such as scrolling.

Even when routines have to be written in machine code the Forth environment still has

(continued on page 89)

(continued from page 87)

some advantages. The routine can initially be written in Forth to test its function in the context of the complete program, particularly its effects on the stack. If the routine works it can be translated into machine code without any alterations to the rest of the program. The routine is called by its name which is more convenient than Rand Usr followed by the address, the technique some Basics use. The main advantage is that since Forth words can be moved around the dictionary by Redefine and Load the machine code must be relocatable.

This article describes 10 screen-handling words written in machine code for the Jupiter Ace. Any combination of them may be included in ordinary Forth programs where speed is important. No knowledge of machine code is required to use them since once they have been entered they act like any other words in the Forth dictionary. The simplest way to enter the code is by using the defining word "Code" described on page 147 of the Jupiter Ace manual:

```
DEFINER CODE
DOES>
 CALL
;
```

The machine code is entered by typing Code then the name of the word followed by the decimal code, each byte being separated by C,. For example the Scrollup routine would be entered by typing:

```
CODE SCROLLUP 33 C, 32 C, 36 C,
         17 C, 0 C, etc.
```

On pressing Enter the whole typed section will be copied to the upper screen and OK will appear after it. The word can then be executed by typing its name, for example:

```
SCROLLUP
```

Code is not a very user-friendly word but, since it is not possible to delete it from the dictionary when the code has been entered, it is important that it should not take up much memory space.

The 10 words will fit into the unexpanded 3K Jupiter Ace, but this does not leave much memory space in which to write programs to utilise the routines. It is better to only enter the words necessary for a specific program.

Here is a description of the individual words: Scrollup scrolls the entire screen one line up and blanks the bottom line; Scrolldown scrolls the entire screen one line down and blanks the top line; Scrollright scrolls the entire screen one column to the right and blanks the left-hand column; and Scrollleft scrolls the entire screen one column to the left and blanks the right-hand column.

Fillscreen fills the screen with a character specified by an ASCII code which should be put on the stack before the word is executed. Fillscreen uses the RST 24 routine in the ROM which takes off the top of the Forth stack and puts it in the DE register pair. Fillforeground fills all the non-blank areas of the screen with a character specified by an ASCII code on the stack. Fillbackground fills all the blank areas of the screen with a character specified by an ASCII code on the stack.

Search&replace takes two numbers from the stack. The first number is the ASCII code of the character to be searched for on the screen. Any occurrence of this character is replaced by another character whose ASCII code is given by the second number. This word is useful to selectively "flash" parts of the screen for explosions or countdowns.

Invert turns all the characters on the screen into their inverse forms. It is useful for explosion effects when used in loops such as this:

```
: BANG
  21 1
  DO
   INVERT I 10 * 60 BEEP
  LOOP
;
```

Border prints a border round the edge of the screen using the character specified by an ASCII code on the stack. ■

```
SCROLLUP
( - )
LD HL (9248)    33   32   36
LD DE (9216)    17    0   36
LD B (22)        6   22
PUSH BC        197
LD B (32)        6   32
LD A (HL)      126
EX DE HL       235
LD (HL) A      119
INC HL          35
EX DE HL       235
INC HL          35
DJNZ (-8)       16  248
POP BC         193
DJNZ (-14)      16  242
DEC HL          43
LD A (32)       62   32
LD B A          71
LD (HL) A      119
DEC HL          43
DJNZ (-4)       16  252
JP (IY)        253  233

SCROLLDOWN
( - )
LD HL (9919)    33  191   38
LD DE (9951)    17  223   38
LD B (22)        6   22
PUSH BC        197
LD B (32)        6   32
LD A (HL)      126
EX DE HL       235
LD (HL) A      119
DEC HL          43
EX DE HL       235
DEC HL          43
DJNZ (-8)       16  248
POP BC         193
DJNZ (-14)      16  242
INC HL          35
LD A (32)       62   32
LD B A          71
LD (HL) A      119
INC HL          35
DJNZ (-4)       16  252
JP (IY)        253  233

SCROLLRIGHT
( - )
LD HL (9950)    33  222   38
LD DE (9951)    17  223   38
LD B (23)        6   23
PUSH BC        197
LD B (31)        6   31
LD A (HL)      126
EX DE HL       235
LD (HL) A      119
DEC HL          43
EX DE HL       235
DEC HL          43
DJNZ (-8)       16  248
EX DE HL       235
LD A (32)       62   32
LD (HL) A      119
DEC HL          43
EX DE HL       235
DEC HL          43
POP BC         193
DJNZ (-21)      16  235
JP (IY)        253  233

SCROLLLEFT
( - )
LD HL (9217)    33    1   36
LD DE (9216)    17    0   36
LD B (23)        6   23
PUSH BC        197
LD B (31)        6   31
LD A (HL)      126
EX DE HL       235
LD (HL) A      119
INC HL          35
EX DE HL       235
INC HL          35
DJNZ (-8)       16  248
EX DE HL       235
LD A (32)       62   32
LD (HL) A      119
INC HL          35
EX DE HL       235
INC HL          35
POP BC         193
DJNZ (-21)      16  235
JP (IY)        253  233

FILLSCREEN
(ASCII CODE- )
RST 24         223
LD A E         123
LD HL (9216)    33    0   36
LD B (23)        6   23
PUSH BC        197
LD B (32)        6   32
LD (HL) A      119
INC HL          35
DJNZ (-4)       16  252
POP BC         193
DJNZ (-10)      16  246
JP (IY)        253  233

BORDER
(ASCII CODE- )
RST 24         223
LD A E         123
LD HL (9216)    33    0   36
LD B (32)        6   32
LD (HL) A      119
INC HL          35
DJNZ (-4)       16  252
LD DE (31)      17   31    0
LD B (21)        6   21
LD (HL) A      119
ADD HL DE       25
LD (HL) A      119
INC HL          35
DJNZ (-6)       16  250
LD B (32)        6   32
LD (HL) A      119
INC HL          35
DJNZ (-4)       16  252
JP (IY)        253  233
```

SPECTRUM 48K : ZX81 16K
SIX PART ADVENTURE



BLACK CRYSTAL
THE QUEST IS ABOUT TO BEGIN

The ultimate role-playing adventure for the SPECTRUM/ZX81. You can become a warrior, elf or wizard on a quest to find and use the rings of creation: to destroy the Black Crystal and defeat the Lords of Chaos. Held within six programs lies a land of fabulous treasures and mythical monsters. Journey through the land of Beroth, explore the castle of shadows, descend into the Shaggoths lair, search for diamonds in the sea of sand but beware of sand sharks! Confront the fire demon in his temple, battle against the Lords of Chaos and win your way to the Black Crystal.

By splitting Black Crystal into six programs we can provide more variety and detail than any other adventure for the Sinclair computers.

Real time monster battles. Superb graphics. Save game feature. All six parts are supplied together on cassette, boxed with instruction booklet.

SPECTRUM 48K: 180K OF PROGRAM IN SIX PARTS — ONLY £7.50
ZX81 16K: OVER 100K OF PROGRAM IN SEVEN PARTS — ONLY £7.50
WHY PAY MORE FOR LESS OF AN ADVENTURE

CARNELL SOFTWARE

To: CARNELL SOFTWARE, DEPT 2, 4 STAUNTON RD, SLOUGH. SL2 1NT.
Please send me: Black Crystal for my,

☐ Spectrum 48K................ £7.50
☐ ZX8 16K.................... £7.50

I enclose a cheque/postal order (payable to Carnell Software) for £ ______

NAME..

ADDRESS.......................................

....

TRADE ENQUIRIES WELCOME

Educational Software
Logical

HIGH QUALITY SOFTWARE FOR THE BBC MICRO

LASERMATHS
An educational game based on addition, subtraction, multiplication and division of whole numbers. The more answers you get right the more alien spacecraft you can destroy, and the higher your rank becomes. Highly motivating. Type, size and difficulty level of problems can all be set. Full colour graphics and sound. Now in use in Primary, Secondary and Special Schools. Ideal for home use. £7.50

*** AS SEEN ON BBC TV ***

MAP REFERENCES
A two program package to practise 6-Figure Grid References. Graded difficulty-find the Pirate Treasure or Guide the helicopter to the enemy submarine! Full colour animated graphics and sound. £7.50

CLASSMASTER
A sophisticated teacher's markbook analysis program. Sort, Rank, Edit, Print, Save on Tape. Includes sample DATA tape and comprehensive Training Manual. £20.00

KEYDEFINER
Make your programming easier. Provides up to 60 defined function keys on the BBC micro. Choose Teletext codes. BASIC keywords, Assembler mnemonics or your own set of key definitions created with this package. Easy to use — very powerful. Machine code routines save memory in your programs, make listings easier to read. £7.50

PICTURE
A sophisticated, versatile and simple to use character defining package with outstanding facilities for character manipulation. Design a character, rotate it, invert it, mirror it or put it in reverse field. View characters in other Modes. Combine characters into high resolution pictures. Save characters and pictures on tape. Full illustrated instruction booklet. £7.50

Available soon: MELODY, GRAPH PACK, WORD PLAY.

All our software has been thoroughly field tested before release and comes on high quality cassettes, fully guaranteed for one year. Each package is accompanied by a detailed instruction booklet, describing the program and how to use it. Our pgorams are already in use in many schools throughout the country. All programs will work on all Operating Systems, and are Disk compatible.
Please add 50p p&p per order. Detailed catalogues available (SAE please).

Sales Department
Logical Educational Software
12, Rowditch Avenue, Derby DE3 3LD

Also available from selected BBC stockists.

DOBSOFT
BBC SOFTWARE

HURRY! available now 2 fabulous new games and other programs, educational and utilities.

THE GRANGE ADVENTURE
A full graphical adventure set in a comprehensive school. Plenty of laughs. Colour and Sound.
Model B £7.95

HELL'S LANDING
An action packed variable skill program in which you land your craft by bombing the city below. In both BASIC and machine code.
Model A and B £5.95

EDUCATIONAL
Teach yourself to use BBC Computer. Geography and Maths programs.
£5 each or all three for £12

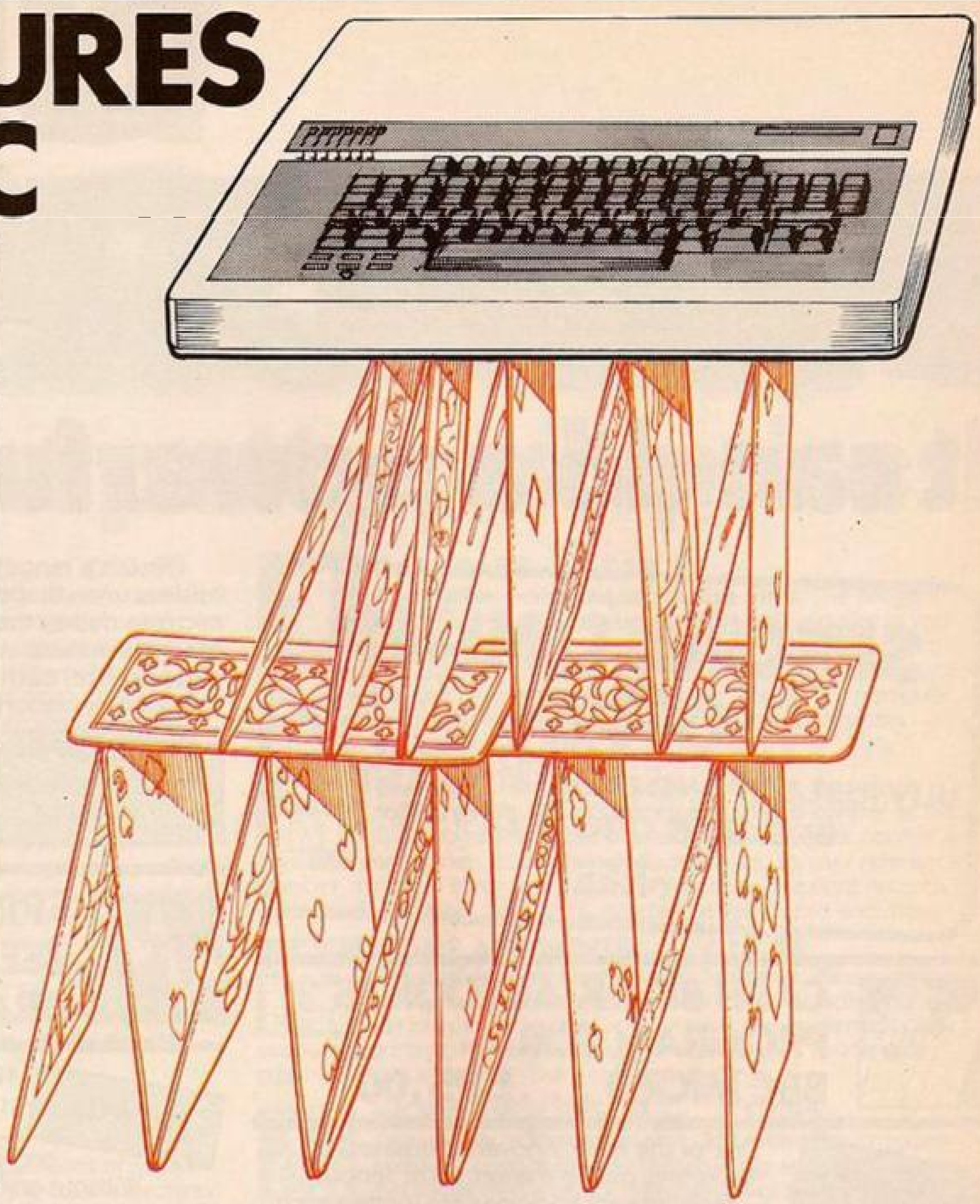
UTILITIES
SALVAGE. Salvage your 0.1. operating system faults from cassette and your program from the bad program error. An invaluable program.
Mode A and B £3.95
80 Second EPSON Hi-resolution printer dump. **£3.00**
1.2 Operating System RS423 receive and transmit program.
Model B £3.00

To order please send cheque/P.O. made payable to:

DOBSOFT
"Rivendell", 13 Pwll-y-min,
Peterston-super-Ely, Cardiff CF5 6LR

STRUCTURES FOR BBC

Woodward and Berry's card game makes learning structures fun.



HOUSE OF CARDS

WE ALL KNOW what it is like — you get a brilliant idea, so you dash to the machine, and start bashing keys in excitement. Hours later, what seemed to be so straightforward has become a nightmare. So, you down the last coffee, dump the program to tape, and stagger off to bed, hoping it will be all right in the morning. In fact, next morning your program looks for all the world as though it were the work of an alien intelligence. You plod through it, trying to remember what the variables represent, and just why you added that complicated set of conditions to statement 10204. The logical paths through your program intertwine, like a bowl of spaghetti.

This does not prove that you are not cut out for programming. The job did not go wrong because of lack of programming skill — it was doomed from the moment you switched on the machine because you started unprepared. Programming is an error-prone business — a spelling mistake in a letter is pretty trivial, but in a computer program absolute accuracy is crucial.

Although errors are inevitable, the earlier in the development process they are discovered, the easier and quicker it will be to fix them.

The most efficient, accurate, testable and maintainable computer programs are those whose structure most closely resembles the job that the program has been designed to do.

Writing programs that work, and completing them before you get fed up with them, is fun. Unless we pay due regard to the above maxim, that fun will be replaced by misery and frustration. So, what we want is a methodology for approaching this programming task — and structured programming is just that.

Let's go back to that wonderful inspirational moment when the idea comes. Instead of rushing to your machine and spoiling it all, grab a piece of paper and write down in plain language what the objective of the program is. The original statement is usually termed "the problem". Next, try to break down the main problem into subordinate problems, the essential things your program has to achieve to solve the problem. You can continue in this way, building a hierachy of problems at increasing levels of detail.

So far, this may all sound pretty trite — where is the methodology? There are many different schemes to be found in books and in use, but they all attempt to show the same things: a hierachy of problems; decisions or branches; loops or iterations.

From now on, we will try to explain the process by developing a program to play the card game of Pelmanism. If you are not familiar with the game, do not worry — all will be revealed as we proceed. You will acquire the necessary knowledge as your analysis gets deeper into the problem. Approaching problem analysis in this layered way is called top-down design.

Figure 1 shows a possible first-level breakdown of the Pelmanism problem. The main problem, "Play Pelmanism", is found to consist of two sub-problems, "Set up game" and "Play Game". The diagram is read top-to-bottom, left to right, so the diagram tells you that you have to set up the game before you can play it.

We discover that set-up consists of getting a pack of playing cards, shuffling them, and then laying them all, face down, in random places on the table. Figure 2 shows how these sequential tasks are added to the diagram.

That is probably as far as we need to go at present in the set-up problem area, so let us now analyse the play-game problem. We discover the rules are that two players take turns. At each turn, the player turns up two cards. If they are of the same value, for example two kings, the player gets a point, and the cards are removed.

If they are not of the same value, they are replaced in their original positions, face down. So, we have a loop — rotate around the players in turn — and a decision — if the cards match, do one thing, otherwise do something else. Figure 3 shows how the play-game problem can be broken down to incorporate these tasks, and includes the loop and the decision. The loops are represented by curved arrows. The decision is represented by a little diamond.

It should be apparent that what happens on Player B's turn is essentially the same as happens for Player A. We have revealed a whole chunk of problem which might have

(continued on page 99)

GEMIN

PERFORMAN

It can do a powerful job for yo

SPECIAL LIMITED OFFER

Buy just any two programs at £19.95 and take one at £19.95 FREE!

CASH BOOK ACCOUNTS PROGRAM FOR BBC MICRO . . .£95.00

New

One of the most innovative business programs on the market. Most serious accountancy packages are written and coded by professional and competent programmers. The Gemini Cashbook Accounting program was written by practising Chartered Accountants and coded by professional and competent programmers. This is a fundamental difference.

This practical program is simple to use and will replace your manual cash and bank records and by giving you instant management information, it may even put your accountant out of job!

With exceptionally exhaustive user documentation, full technical back up and product update policy this program will increase the efficiency and profitability of your business. Take a look at the information this program will provide.

* summary of VAT information to enable you to complete your VAT returns
* cumulative receipts and payments report analysed over the standard profit and loss and balance sheet heading.
* option for departmental analysis of sales and purchases
* print out of all transactions
* journal routine for entering transfers between accounts and year end adjustment for debtors, creditors etc.
* year end trial balance
* profit and loss account and balance sheet.

These statements can be produced at what ever interval you require e.g. monthly, quarterly or annually.

Coming soon:– Integrated Sales + Purchase Ledgers

"... the systems worked immaculately when tested ..."
"Mailist is a very professional piece of software ..."
(Which Micro & Software Review Feb 83)

Here's a range of software for the independent businessman that's designed to harness the power of your micro to deliver the vital information you need in all key areas of your business. A breakthrough on both price and performance, each program is fully tested and comes with all the documentation back up you need.

"Gemini's range of software is in the vanguard of the releases for 'serious' micro users . . ."
(Which Micro and Software Review)

SPREADSHEET ANALYSIS BEEBCALC £19.95 DRAGONCALC £19.95

New

FOR BBC AND DRAGON 32. Spreadsheet processors have proved to be important tools for using micros in business, scientific and domestic financial applications.

Without any programming knowledge at all, you may:–

* Set up a computerised spreadsheet, with chosen row and column names.
* Specify formulae relating any row or column to any other.
* Enter your source data and have the results calculated.
* Save the results on tape (or disk – BBC) for later reloading and manipulation.
* Print the tabulated results in an elegant report format.
* Experienced users may access saved files and write their own reporting or graphics presentation programs for the results.

Some typical applications:–

* Small business accounting applications, e.g. profit and loss statements and cashflow projections, break-even analyses etc.
* Investment project appraisal – anything from double glazing to oil rigs!
* Comparing rent/lease/buy options
* Processing the results of scientific experiments or field studies
* Engineering calculation models
* In fact, anything that involves repeated re-calculation of results presented in tabular or spreadsheet format.

Program Availability Chart:–

	Database	Stock Control	Mailist	Invoices & Statements	Spread sheet Analysis	Cashbook Accounting	Word processor	Home Accounts	Commercial Accounts
Sinclair Spectrum 16k or 48k	●	●	●					●	●
Dragon 32k or 64k	●				●			●	
VIC20 (16k+)	●	●	●	●				●	●
Sinclair ZX81 (16k+)	●								
Grundy Newbrain	●								
Texas TI99 4A	●								
Atari 400/800 or Osborne 1	●								
Sharp MZ80A	●	●	●	●				●	●
Sharp MZ80K	●	●	●	●				●	●
Sharp MZ80B	●	●	●	●				●	●
BBC micro model A or B 32K	●	●	●	●	●	●	●	●	●

I'S NEW

E SOFTWARE

ur business at petty cash prices.

INVOICES AND STATEMENTS . . . £19.95

Compatible with most micros. See table. Ideal for the small business. A complete suite of programs together with generated customer file for producing crisp and efficient business invoices and monthly statements on your line printer. All calculations include VAT automatically, and the program allows your own messages on the form produced. This program gives you superb presentation and saves time on one of the most tedious tasks in the office.

COMMERCIAL ACCOUNTS . . . £19.95

Compatible with most micros. See table. A gem of a program, all for cassette, with the following features:– Daily Journal. Credit Sales. Cash Sales. Credit Purchases. Purchases – other. Sales Ledger. Purchase Ledger. Bank Account. Year to date summary. A fully interactive program suitable for all businesses. Files can be saved and loaded and totals from one file carried forward to another on cassette. Particularly useful from a cash flow point of view, with an immediate accessibility to totals for debtors and creditors. Bank totally supported with entries for cheque numbers, credits and, of course, running balance.

MAILING LIST . . . £19.95

Compatible with most micros. See table. A superb dedicated database to allow for manipulations of names and addresses and other data. Gemini's unique 'searchkey' system gives you a further ten 'user-defined parameters' to make your own selections. Features include the facility to find a name or detail when only part of the detail is known, it will print labels in a variety of user specified formats.

DATABASE . . . £19.95

Compatible with most micros. See table. The program that everyone needs, the most valuable and versatile in your collection. Facilities include sort search, list print if required. Can be used in place of any card index application; once purchased you can write your own dedicated database to suit your particular needs with a limitless number of entries on separate cassettes.

STOCK CONTROL . . . £19.95

Compatible with most micros. See table. Dedicated software with all that's necessary to keep control of stock. This program will take the tedium out of stock control and save time and money. Routines include stock set up, user reference number, minimum stock level, financial summary, line print records, quick stock summary, add stock, delete/change record and more.

HOME ACCOUNTS . . . £19.95

Compatible with most micros. See table. Runs a complete home finance package for you with every facility necessary for keeping a track of regular and other expenses, bank account mortgage, H.P. etc. This program also allows you to plot graphically by Listograms your monthly outgoings.

WORD PROCESSOR . . . £19.95

Compatible with most micros. See table. This program features routines found in much larger and more expensive packages with a typical word length of 5-6 letters it allows for around 1000 words in memory at one time. Ideal for the user who requires a simple program to write letters on his computer. Features include, block delete, block insert, search and replace, edit text, display text and more.

Dealer/Trade enquiries invited — generous trade discounts for quantity
Special ACCESS card instant sales hotline for GUARANTEED prompt despatch . . . Tel: 03952-5165

24-hr Ansaphone Service.
All enquiries other than credit card sales to 03952-5832
Gemini. Functional Software Specialists. 9, Salterton Road, Exmouth, Devon EX8 2QG

Tick the box for Program you require. Prices include V.A.T. and Package and Postage.
Please supply the following cassette software.

Database	£19.95 ☐	ZX81 16K Database	£9.95 ☐
Stock Control	£19.95 ☐	BBC Cash Book disk or tape	£95.00 ☐
Mailing List	£19.95 ☐	BBC Disks – other titles	£23.95 ☐
Invoices and Statements	£19.95 ☐	Osborne Disk Database	£23.95 ☐
Commercial Accounts	£19.95 ☐	Word processor	£19.95 ☐
Home Accounts	£19.95 ☐	Beebcalc	£19.95 ☐
		Dragoncalc	£19.95 ☐

Name ____________________

Address ____________________

Machine Type ____________ Memory Size ____________

I enclose ____________________

Make cheques and postal orders payable to Gemini Marketing Ltd.

Diners Card Number ____________ Access Number ____________

Signature ____________

Gemini. Functional Software Specialists, 9 Salterton Road, Exmouth, Devon EX8 2QG.

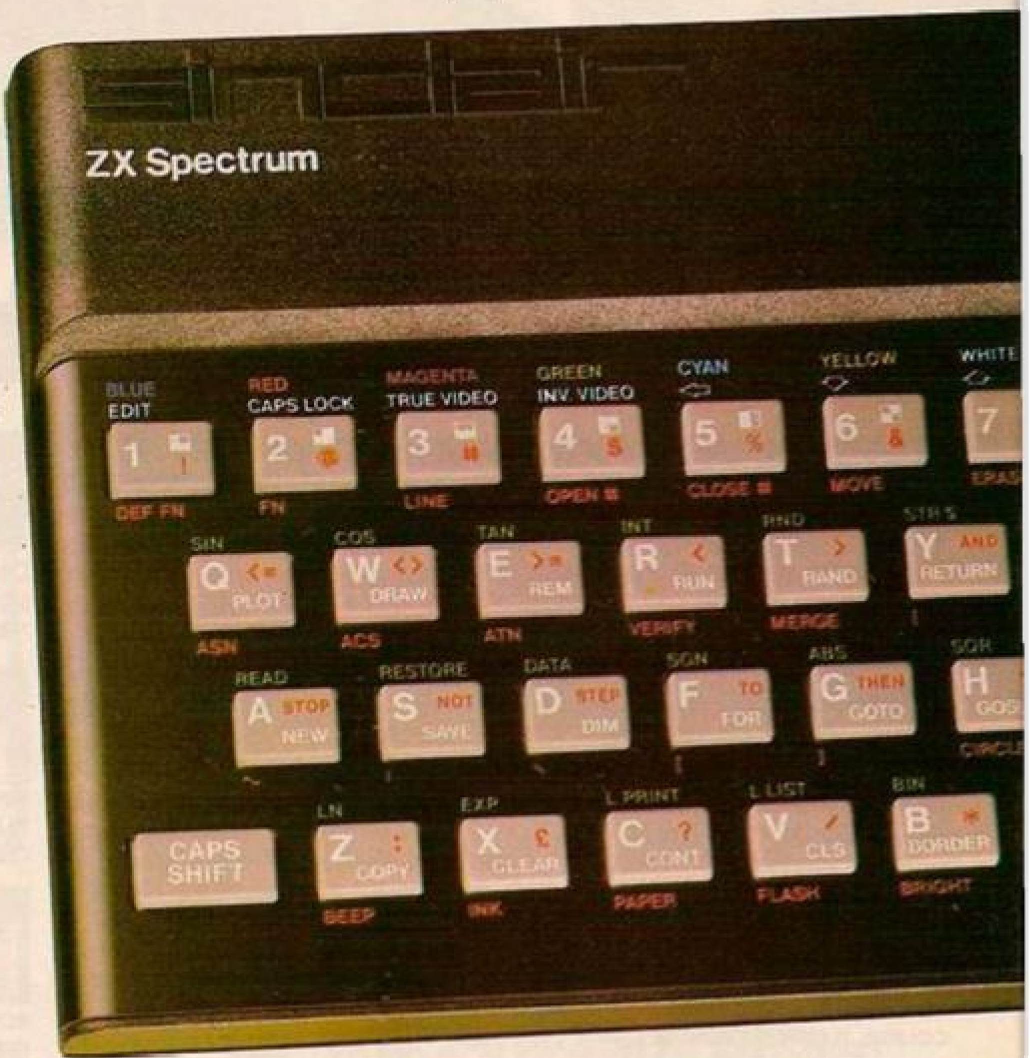
YC5



Sinclair ZX Spectr

16K or 48K RAM... full-size moving-key keyboard... colour and sound... high-resolution graphics...

From only £125!



First, there was the world-beating Sinclair ZX80. The first personal computer for under £100.

Then, the ZX81. With up to 16K RAM available, and the ZX Printer. Giving more power and more flexibility. Together, they've sold over 500,000 so far, to make Sinclair world leaders in personal computing. And the ZX81 remains the ideal low-cost introduction to computing.

Now there's the ZX Spectrum! With up to 48K of RAM. A full-size moving-key keyboard. Vivid colour and sound. High-resolution graphics. And a low price that's unrivalled.

Professional power–personal computer price!

The ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can uprate later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

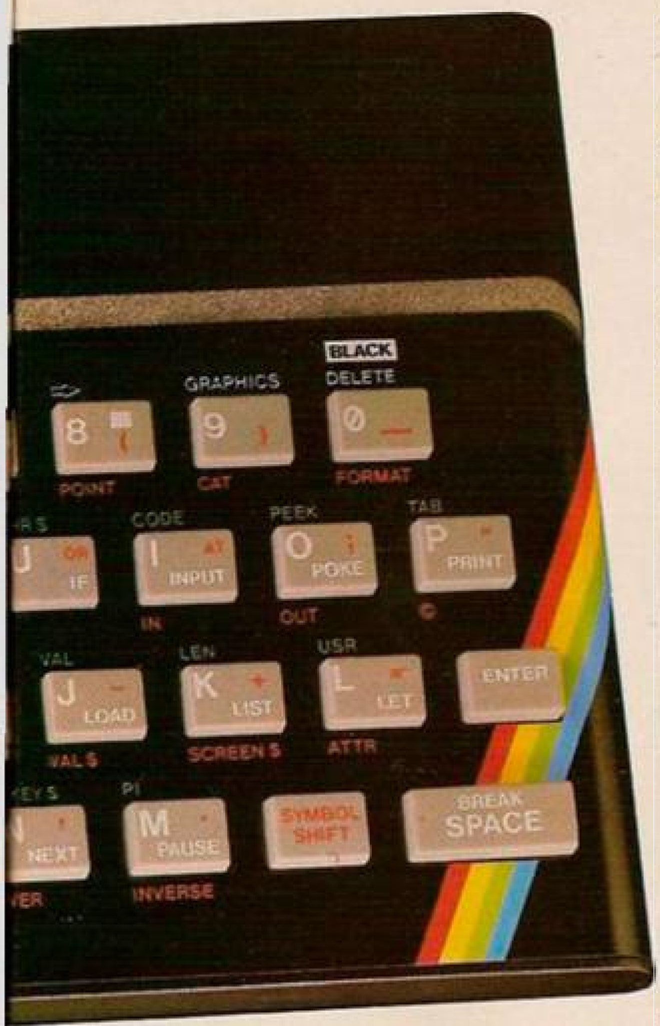
There's no need to stop there. The ZX Printer – available now – is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.



Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound – BEEP command with variable pitch and duration.
- Massive RAM – 16K or 48K.
- Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set – with upper- and lower-case characters.
- Teletext-compatible – user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC – incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

um



ZX Spectrum software on cassettes – available now

The Spectrum software library is growing every day. Subjects include games, education, and business/ household management. Flight Simulation...Chess...Planetoids... History...Inventions...VU-CALC...VU-3D ...Club Record Controller...there is something for everyone. And they all make full use of the Spectrum's colour, sound, and graphics capabilities. You'll receive a detailed catalogue with your Spectrum.

ZX Expansion Module

This module incorporates the three functions of Microdrive controller, local area network, and RS232 interface. Connect it to your Spectrum and you can control up to eight Microdrives, communicate with other computers, and drive a wide range of printers.

The potential is enormous, and the module will be available in the early part of 1983 for around £30.

sinclair

Sinclair Research Ltd, Stanhope Road, Camberley, Surrey GU15 3PS. Tel: Camberley (0276) 685311.

The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.

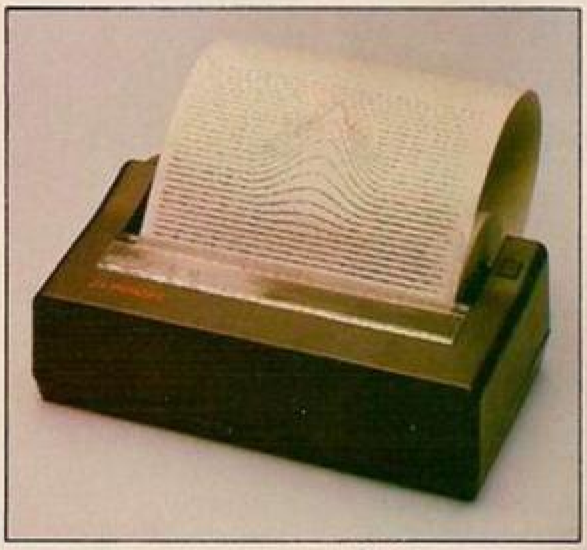
The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing by providing mass on-line storage.

Each Microdrive can hold up to 100K bytes using a single interchangeable storage medium.

The transfer rate is 16K bytes per second, with an average access time of 3.5 seconds. And you'll be able to connect up to 8 Microdrives to your Spectrum via the ZX Expansion Module.

A remarkable breakthrough at a remarkable price. The Microdrives will be available in the early part of 1983 for around £50.





How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST – use the no-stamp needed coupon below. You can pay by cheque, postal order, Barclaycard, Access or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR. **Order**

Qty	Item	Code	Item Price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
	orders over £100	29	4.95	
			Total £	

Please tick if you require a VAT receipt ☐

*I enclose a cheque/postal order payable to Sinclair Research Ltd for £______

*Please charge to my Access/Barclaycard/Trustcard account no.

*Please delete/complete as applicable

Signature

PLEASE PRINT

Name: Mr/Mrs/Miss

Address

YOC 905

FREEPOST – no stamp needed. Prices apply to UK only. Export prices on application.

Let Commodore expand your horizons.

VIC 20 is the finest home computer that money can buy.

And the better you get to know it, the more confident, adventurous and ambitious you'll become.

You'll want to take advantage of the vast range of VIC software: a superb and constantly-growing selection of programs, embracing business systems, entertainment, education and many applications in the home.

Every program in the series has been designed by experts, and chosen for its quality and value for money.

VIC business software covers a wide range of applications, including spread-sheet analysis, stock control, information handling and word-processing.

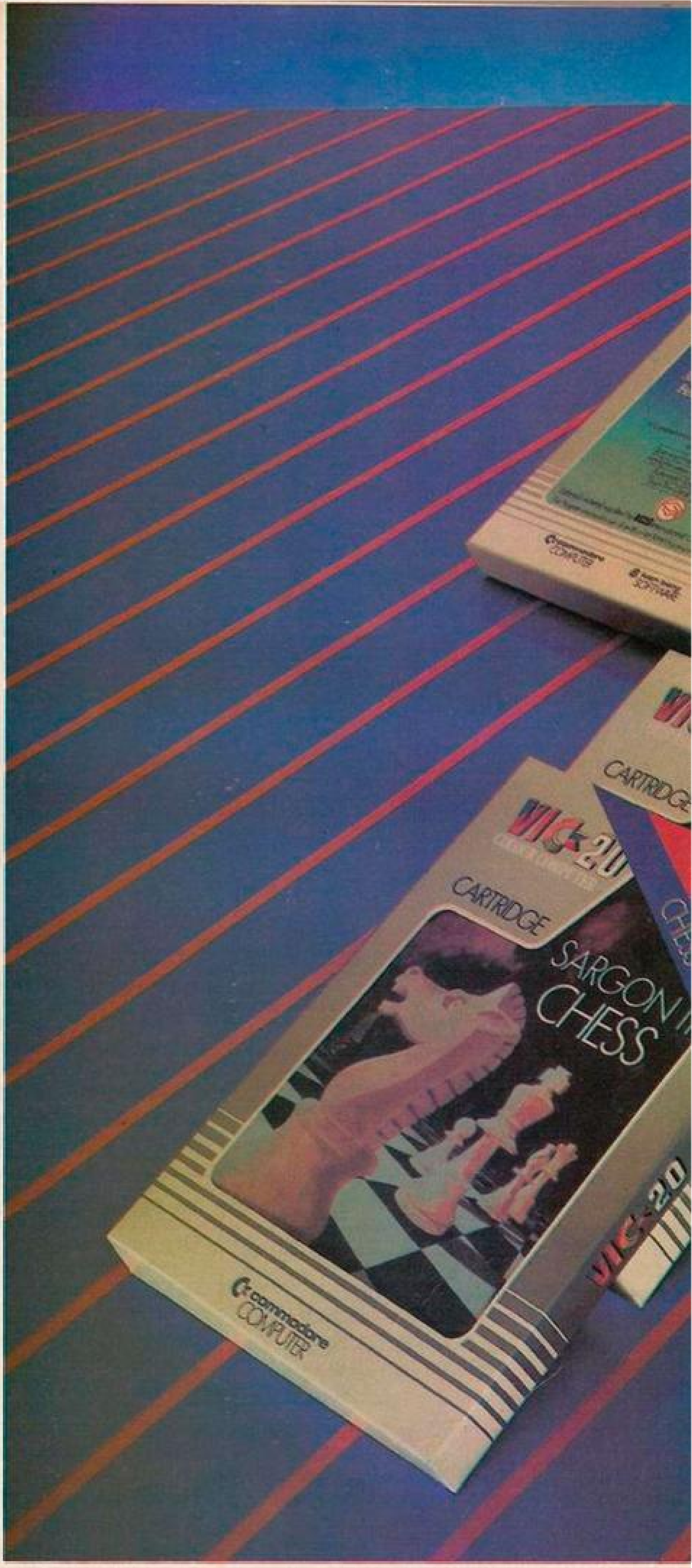
A mind-blowing range of games including Scott Adams' world-famous 'Adventure' series.

Advanced space games, including the sophisticated 'Omega Race'.

Learn subjects as diverse as English Language, programming, and biology.

And 'home' software ranges from IQ tests to Robert Carrier menus.

In addition, there is a range of VIC software, like programmers' aids and graphics packages–



to add to your understanding and enjoyment of computers and computing.

There's even a special 'VicSoft' Club for VIC 20 enthusiasts, with many advantages including special offers to club members.



VIC software will expand your horizons. And your mind.

PRICES RANGE FROM £4.99 to £24.95 INC. VAT.

commodore
VIC 20

For more information, a catalogue of VIC software and details of your local retailers or dealers, please phone or complete the coupon and send to:
The Commodore Information Centre,
675 Ajax Avenue, Slough, Berkshire SL1 4BG.
Telephone: Slough (0753) 79292.

Name ______________________
(MR./MRS./MISS)
Address ______________________

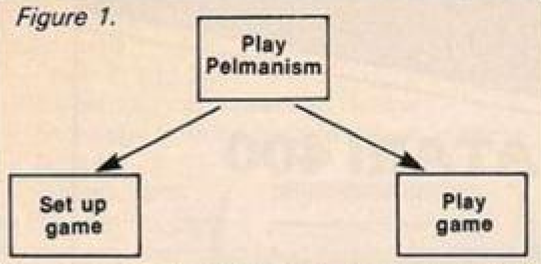
____

Postcode ______________

VCYOC0383

(continued from page 91)

Figure 1.



resulted in duplicate code, had we started to program too early. Of course, most of you would have spotted such duplication straight away, but the principle is valid. If it occurred at a lower level, you might not have recognised it. There is no need to duplicate parts of the diagram, so we simply put the note "as for player A" under "Player B's turn" — see Figure 3.

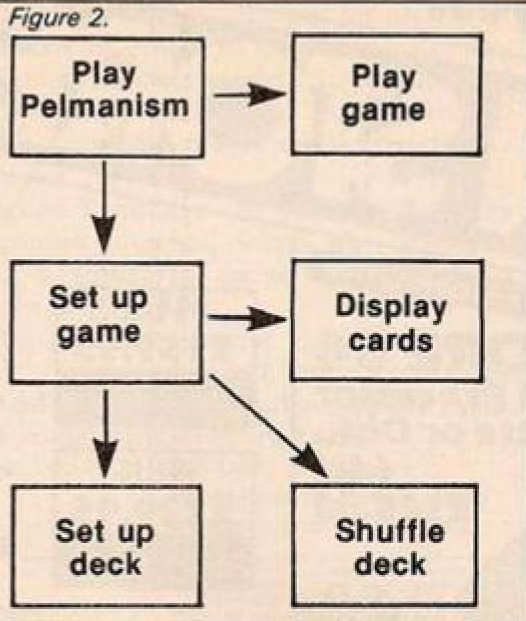
Just identifying a loop is hardly sufficient — we have to say what stops it. Once again, this is expressed in plain words — no flags to be used at this stage, please! Therefore, in Figure 3, we have added legends like "Repeat until all the cards have been paired" to the arrows representing the loops. Similarly, we have defined the decisions, but, because of lack of space, these definitions appear as footnotes. The other addition in Figure 3 is the box "Print Results". We have decided that, at the end of the game, we should display the scores.

We hope you can see already that this is an easy-to-understand representation of the game problem. You will notice that it describes the Problem, and not the Solution — so it is just as appropriate as a description of the game as played with cards as of its simulation on the computer. Therefore, when you do eventually code it, your program will represent reality, will correspond closely in structure to your design solution, and you will be able to enhance it later, if you wish.

Notice also that the structure diagram is universal, and is not tied to any particular programming language or dialect, or to any particular computer. For example, we have not said whether the loops will be implemented as "For-Next", "Repeat-Until" or "Do-While".

Now, although we have some way to go to fully define the problem, at the level of detail required for a complete solution, we could at this stage start to write the program. The

Figure 2.



essence of the structured "top-down" approach is that it does make it possible to develop programs in a modular way. Let us take the low-level boxes, such as "Pick a card". They are still black boxes at this stage, and can be coded as dummy procedures or sub-routines. Such dummies are known in the trade as "stubs". You can then run and test your skeleton program for basic errors. If you include temporary Print statements within your "stubs", you can prove to yourself that the procedures or sub-routines are being entered and left in the correct sequence. Note that you may have to force the program to proceed from one state to another by other temporary statements. Take the following example:

```
  10 PROCA (or GOSUB 1010)
  20 FLAG=0
  30 REPEAT
  40 PROCB (or GOSUB 2010)
  50 UNTIL FLAG=1
  60 PROCC (or GOSUB 3010)
  70 END
1000 DEF PROCA (not required for GOSUB)
1010 PRINT "PROCA HAS BEEN EXECUTED"
1999 ENDPROC (or RETURN)
2000 DEF PROCB (not required for GOSUB)
2010 PRINT "PROCB HAS BEEN EXECUTED"
2999 ENDPROC (or RETURN)
3000 DEF PROCC (not required for GOSUB)
3010 PRINT "PROCC HAS BEEN EXECUTED"
3999 END PROC (or RETURN)
```

Clearly, the program will get stuck in the loop which calls procedure B for ever and a day. Of course, the real code to be placed in procedure B will do something which results in Flag being set to "1", but you have not written this yet. So, once you have tested the program as above, simply insert a new statement 2020, setting Flag equal to "1". This will force the program to leave the loop and execute the later code.

To return to the Pelmanism problem, we are approaching an adequate definition, but need to be more precise. For example, the box "Pick a card" needs to be expanded as in figure 4.

Let us now recap on what we have been doing. First, we defined our problem at the highest meaningful level, then at the next level down. We were then able to code our program in skeleton form. As further understanding came, we could expand our structured design downwards into increasing levels of detail, and, at each level, could insert code into "black boxes". This process can be summarised as:

DEFINE OBJECTIVE
DEFINE PROBLEM ELEMENTS
AT CURRENT LEVEL
CODE SKELETON SOLUTION
IF PROGRAM COMPLETE, STOP
OTHERWISE

The more astute of you will be a little cynical about the glib way we suggest you flip from adding a box to the diagram to actually coding it — and quite right, too. The coded solution to one box may, of course, be far from simple. It may require some thought as to how you can program it. Again, we urge you not to try to develop this code at the keyboard. You will find your time is far more productive if you try to sketch out the required code beforehand, using some kind of shorthand notation. This is where we can learn from the experience of professionals, and introduce the concept of "pseudo-code".

Various academics have written doubtless worthy tomes on language systems for pseudo-code. Some advocate a free-form representation, similar to Basic, whilst others prefer to have you fill in complicated-looking forms. Our advice is to forget all that, unless you are intent on immersing your hobby in a bureaucracy. You should develop your own shorthand notation — after all, you are the only person who will have to understand it. It is different for professionals in a big department, where other programmers have to pick up the documentation and work from it.

What does pseudo-code look like? It is somewhere between a precise form of English and the program code itself. Its syntax is loose, but its format should be consistent and clear. The pseudo code for the box "Set-up game" in the Pelmanism problem could be:

Proc set up game
— Set up deck
— Set up a string of card values

(continued on page 101)

Figure 3.

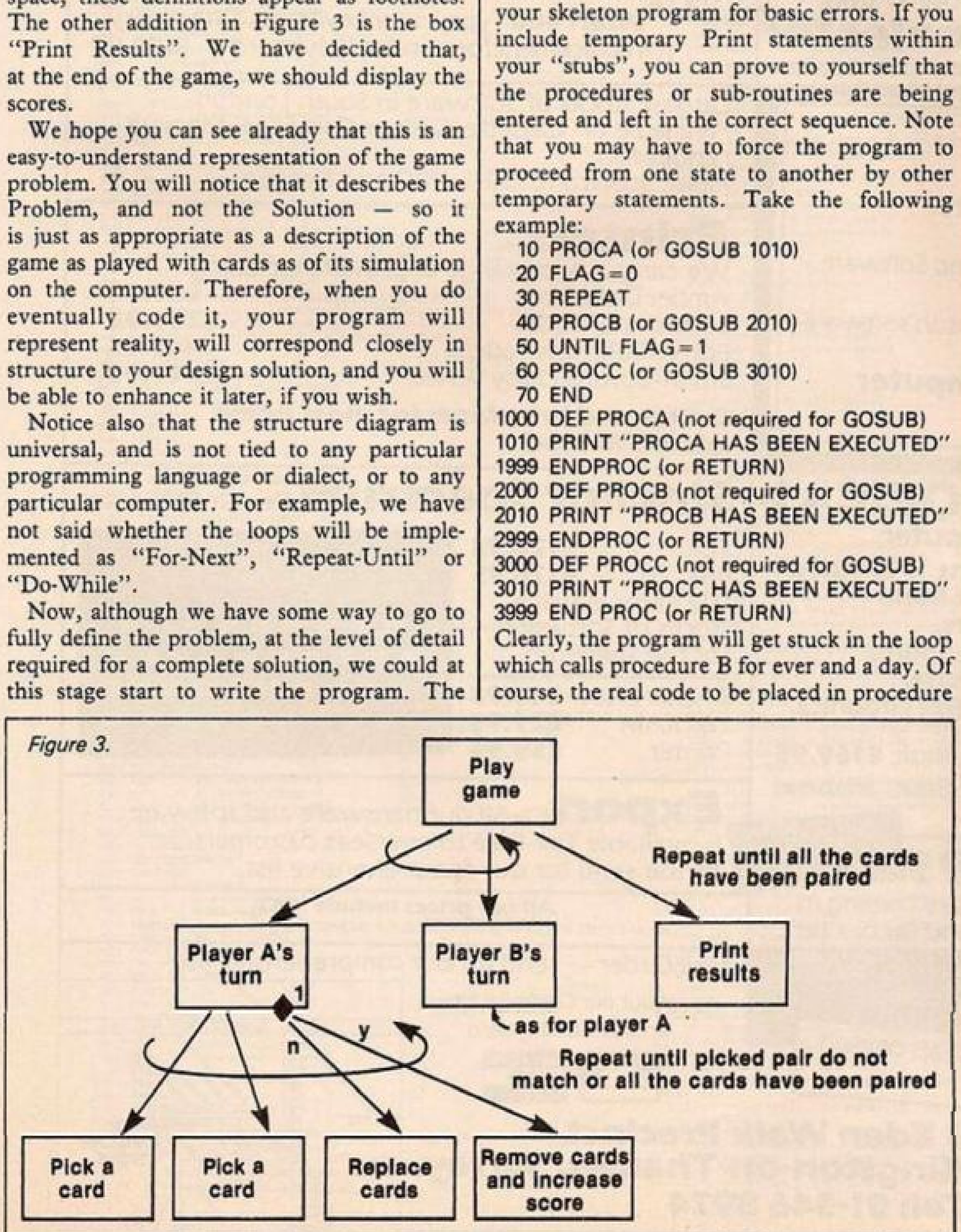
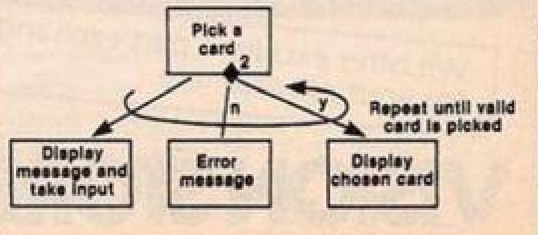


Figure 4.



(continued from page 99)

- Establish address of string

Shuffle cards

- For I = 1 to 20
- Select two card values at random
- Exchange position of card values in string
- Next I
- Display cards

End Proc set-up game

You can see that pseudo-code enables you to resolve most of the problems due to logical flow, off-line. Nothing you do here can wreck the work you have already coded. Once you have fully desk-checked your pseudo-code, it is a straightforward matter to put it into the pedantic language your computer expects.

We know from experience that this methodology works — not just for us, but for thousands of people in the professional programming business as well. It produces the correct results quicker, and that, as we said earlier, does make programming considerably more fun.

Figure 5 contains the full listing of the Pelmanism program, which was developed using a structured design approach. It is written in BBC Basic.

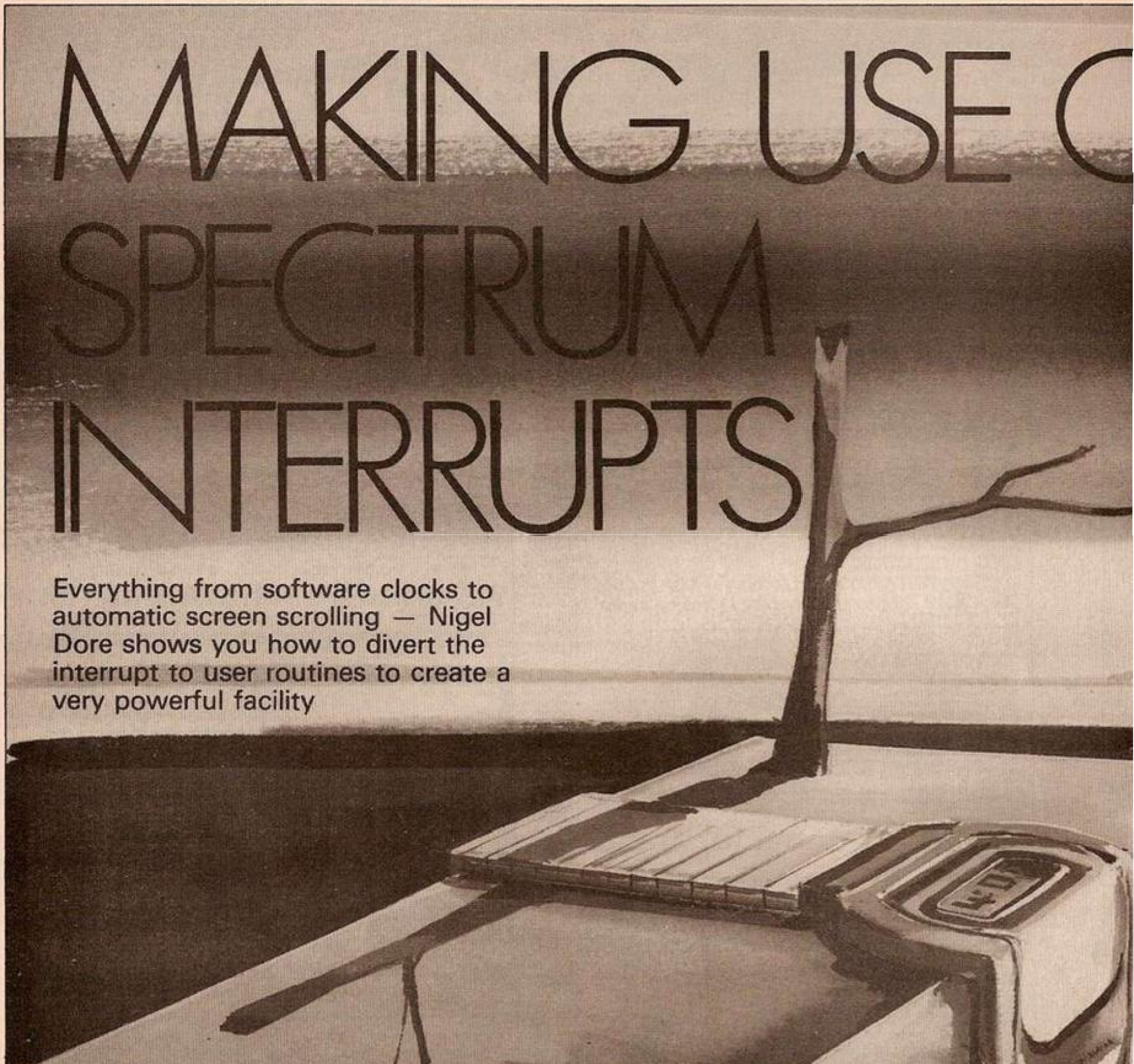
This particular solution uses the Teletext Mode (7), but it could, with benefit, be adapted to use high-resolution graphics mode, with proper pictures of the cards.

Lines 40-110	Main body of program Call routines to Set-up game Play game and Print results
Lines 120-470	Procedure to set up game Card backs are represented by graphics symbols
Lines 480-620	Play Game Uses keys to move cursor, and select card. I-up; M-down; J-left; K-right; R-reveal.
Lines 630-780	Player's turn
Lines 790-870	Pair match
Lines 880-970	No match
Lines 990-1130	Scan keyboard for input
Lines 1140-1370	Move cursor
Lines 1380-1500	Turns over card
Lines 1510-1680	Calculate which card to turn over
Lines 1690-1800	Input players' names
Lines 1910-1910	Prints final scores

(Pelmanism program)

```
  10 REM       **************
  20 REM       * MAIN BODY *
  30 REM       **************
  40 MODE 7
  50 CLS
  60 PROCSETUP
  70 PROCNAME
  80 PROCGAME
  90 PROCRESULT
 100 *FX 4,0
 110 END
 120 DEF PROCSETUP
 130 REM      ****************
 140 REM      * SET UP PACK *
 150 REM      ****************
 160 CARD$=STRING$(4,"A23456789TJQK")
 170 CARD=&3A00
 180 $CARD=CARD$
 190 REM      *****************
 200 REM      * SHUFFLE PACK *
 210 REM      *****************
 220 FOR I=1 TO 200
 230   R1=RND(51)
 240   R2=RND(51)
 250   TEMP=CARD?R1
 260   CARD?R1=CARD?R2
 270   CARD?R2=TEMP
 280   NEXT I
 290 REM      *****************
 300 REM      * DISPLAY DECK *
 310 REM      *****************
 320 VDU 12
 330 DS1$="  9"+STRING$(6,"   9")
 340 DS2$="9"+STRING$(7,"   9")
 350 BORDER$=STRING$(31,",")
 360 PRINT'CHR$(145);" ";CHR$(60);BORDER$;CHR$(108)
 370 FOR I=1 TO 3
 380   PRINTCHR$(145);" ";CHR$(53);SPC(31);CHR$(106)
 390   PRINTCHR$(145);" ";CHR$(53);" ";DS1$;"   ";CHR$(106)
 400   PRINTCHR$(145);" ";CHR$(53);SPC(31);CHR$(106)
 410  PRINTCHR$(145);" ";CHR$(53);" ";DS2$;" ";CHR$(106)
 420   NEXT
 430 PRINTCHR$(145);" ";CHR$(53);SPC(31);CHR$(106)
 440 PRINTCHR$(145);" ";CHR$(53);" ";DS1$;"   ";CHR$(106)
 450 PRINTCHR$(145);" ";CHR$(53);SPC(31);CHR$(106)
 460 PRINTCHR$(145);" ";CHR$(45);BORDER$;CHR$(46)
 470 ENDPROC
 480 DEF PROCGAME
 490 REM      *********************
 500 REM      * GAME STARTS HERE *
 510 REM      *********************
 520 SCOREA=0
 530 SCOREB=0
 540 REPEAT
 550   SCORE=0
 560   PROCTURN(PLY1$)
 570   SCOREA=SCOREA+SCORE
 580   SCORE=0
 590   IF SCOREA+SCOREB < 26 THEN PROCTURN(PLY2$)
 600   SCOREB=SCOREB+SCORE
 610   UNTIL SCOREA+SCOREB > 25
 620 ENDPROC
 630 DEF PROCTURN(PLY$)
 640 REM      *****************
 650 REM      * PLAYERS TURN *
 660 REM      *****************
 670 REPEAT
 680   PRINTTAB(0,21);"PICK YOUR FIRST CARD ";PLY$;SPC(10)
 690   PROCMOVE
 700   CD1=CARD?REV
 710   AD1=ADDRESS
 720   PRINTTAB(0,21);"PICK YOUR SECOND CARD ";PLY$;SPC(10)
 730   PROCMOVE
 740   CD2=CARD?REV
 750   AD2=ADDRESS
 760   IF CD1=CD2 THEN PROCPOINT ELSE PROCFINISH
 770   UNTIL CD1 <> CD2 OR SCORE+SCOREA+SCOREB > 25
 780 ENDPROC
 790 DEF PROCPOINT
 800 REM      *****************
 810 REM      * "PAIR" FOUND *
 820 REM      *****************
 830 FOR I=1 TO 2500:NEXT
 840 ?AD1=32
 850 ?AD2=32
 860 SCORE=SCORE+1
 870 ENDPROC
 880 DEF PROCFINISH
 890 REM      *************
 900 REM      * NO MATCH *
 910 REM      *************
 920 FOR I=1 TO 2500:NEXT
 930 AD1?(-1)=145
 940 ?AD1=57
 950 AD2?(-1)=145
 960 ?AD2=57
 970 ENDPROC
 980 DEF PROCMOVE
 990 REM      ******************
1000 REM      * MOVE "CURSOR" *
1010 REM      ******************
1020 *FX 4,1
1030 PRINTTAB(4,15);
1040 FLAG=0
1050 REPEAT
1060   IN$=INKEY$(0)
1070   IF IN$="I" THEN PROCUP
1080   IF IN$="J" THEN PROCLEFT
1090   IF IN$="K" THEN PROCRIGHT
1100   IF IN$="M" THEN PROCDOWN
1110   IF IN$="R" THEN PROCREVEAL
1120   UNTIL IN$="R" AND FLAG=1
1130 ENDPROC
1140 DEF PROCUP
1150 REM      ******************
1160 REM      * MOVE CURSOR UP *
1170 REM      ******************
1180 IF VPOS > 3 THEN VDU 11:VDU 11 ELSE VDU 7
1190 ENDPROC
1200 DEF PROCDOWN
1210 REM      ********************
1220 REM      * MOVE CURSOR DOWN *
1230 REM      ********************
1240 IF VPOS < 15 THEN VDU 10:VDU 10 ELSE VDU 7
1250 ENDPROC
1260 DEF PROCLEFT
1270 REM      ********************
1280 REM      * MOVE CURSOR LEFT *
1290 REM      ********************
1300 IF POS > 4 THEN VDU 8:VDU 8 ELSE VDU 7
1310 ENDPROC
1320 DEF PROCRIGHT
1330 REM      *********************
1340 REM      * MOVE CURSOR RIGHT *
1350 REM      *********************
1360 IF POS < 32 THEN VDU 9:VDU 9 ELSE VDU 7
1370 ENDPROC
1380 DEF PROCREVEAL
1390 REM      ***************
1400 REM      * REVEAL CARD *
1410 REM      ***************
1420 X=POS
1430 Y=VPOS
1440 ADDRESS=HIMEM+(40*Y)+X
1450 IF ?ADDRESS <> 57 THEN ENDPROC
1460 FLAG=1
1470 IF VPOS=5 OR VPOS=9 OR VPOS=13 THEN PROCEIGHT ELSE PROCSEVEN
1480 ADDRESS?1=145:ADDRESS?(-1)=131
1490 ?ADDRESS=CARD?REV
1500 ENDPROC
1510 DEF PROCSEVEN
1520 REM      *************
1530 REM      * FIND CARD *
1540 REM      *************
1550 Y1=INT(Y/2)
1560 X1=(X-2)/4
1570 Y2=INT(Y1/2)
1580 REV=((Y2*15)+X1)-1
1590 ENDPROC
1600 DEF PROCEIGHT
1610 REM      *************
1620 REM      * FIND CARD *
1630 REM      *************
1640 Y1=INT(Y/2)
1650 X1=X/4
1660 Y2=INT(Y1/2)-1
1670 REV=(7+(Y2*15)+X1)-1
1680 ENDPROC
1690 DEF PROCNAME
1700 REM      ***************
1710 REM      * INPUT NAMES *
1720 REM      ***************
1730 PRINTTAB(0,21)"PLAYER 1 WHAT IS YOUR NAME "
1740 INPUT PLY1$
1750 PRINTTAB(0,22);SPC(40)
1760 PRINTTAB(0,21)"PLAYER 2 WHAT IS YOUR NAME "
1770 INPUT PLY2$
1780 PRINTTAB(0,22);SPC(40)
1790 PRINTTAB(0,21);SPC(40)
1800 ENDPROC
1810 DEF PROCRESULT
1820 REM      *********************
1830 REM      * PRINT FINAL SCORE *
1840 REM      *********************
1850 VDU 12
1860 PRINTTAB(5,5);PLY1$;" YOU HAVE SCORED ";SCOREA
1870 PRINTTAB(5,8);PLY2$;" YOU HAVE SCORED ";SCOREB
1880 IF SCOREA > SCOREB THEN PRINTTAB(3,13);CHR$(141);CHR$(136);PLY1$;CHR$(137)
;"YOU'VE WON !",TAB(3,14);CHR$(141);CHR$(136);PLY1$;CHR$(137);"YOU'VE WON !"
1890IF SCOREB > SCOREA THEN PRINTTAB(3,13);CHR$(141);CHR$(136);PLY2$;CHR$(137);
"YOU'VE WON !",TAB(3,14);CHR$(141);CHR$(136);PLY2$;CHR$(137);"YOU'VE WON !"
1900 IF SCOREA = SCOREB THEN PRINTTAB(3,13);CHR$(141);CHR$(136);"IT'S A DRAW !"
;TAB(3,14);CHR$(141);CHR$(136);"IT'S A DRAW !"
1910 ENDPROC
1920 DEF PROCINSTR
1930 REM        ****************
1940 REM        * INSTRUCTIONS *
1950 REM        ****************
1960 CLS
1970 PRINTTAB(11,3);CHR$(135);CHR$(157);CHR$(129);CHR$(141);"PELMANISM   ";CHR$
(156)
1980 PRINTTAB(11,4);CHR$(135);CHR$(157);CHR$(129);CHR$(141);"PELMANISM   ";CHR$
(156)
1990 PRINTTAB(0,10);
2000 INPUT"DO YOU REQUIRE INSTRUCTIONS ", ANSWER$
2010 IF MID$(ANSWER$,1,1) <> "Y" THEN ENDPROC
2020 PRINTTAB(0,8);"  PELMANISM is a simple card game for''" two players.The ca
rds are placed face''" down,the object is to turn up pairs"
2030 PRINTTAB(0,14);CHR$(130);" Each player takes it in turn to try"';CHR$(130)
;"and pick two cards which match,if they"';CHR$(130);"are a pair then they are r
emovd from"
2040 PRINTCHR$(130);"the pack and the successful player gets";CHR$(130);"anothe
r turn."'';CHR$(129)"The winner is the player who has turned";CHR$(129);"over th
e greatest number of pairs at"
2050 PRINTCHR$(129);"the end."
2060 PRINTTAB(10,24);CHR$(131);CHR$(136);"Press any key to continue"
2070 A$=GET$
2080 CLS
2090 PRINTTAB(11,3);CHR$(135);CHR$(157);CHR$(130);CHR$(141);" CONTROLS    ";CHR
$(156)
2100 PRINTTAB(11,4);CHR$(135);CHR$(157);CHR$(130);CHR$(141);" CONTROLS    ";CHR
$(156)
2110 PRINTTAB(0,10);CHR$(129);" I ";CHR$(135);"- TO GO UP"
2120 PRINTTAB(0,12);CHR$(129);" M ";CHR$(135);"- TO GO DOWN"
2130 PRINTTAB(0,14);CHR$(129);" J ";CHR$(135);"- TO GO RIGHT"
2140 PRINTTAB(0,16);CHR$(129);" K ";CHR$(135);"- TO GO LEFT"
2150 PRINTTAB(0,18);CHR$(129);" R ";CHR$(135);"- TO REVEAL THE CARD"
2160 PRINTTAB(10,24);CHR$(131);CHR$(136);"Press any key to continue"
2170 A$=GET$
2180 ENDPROC
```

MAKING USE O SPECTRUM INTERRUPTS



Everything from software clocks to automatic screen scrolling — Nigel Dore shows you how to divert the interrupt to user routines to create a very powerful facility

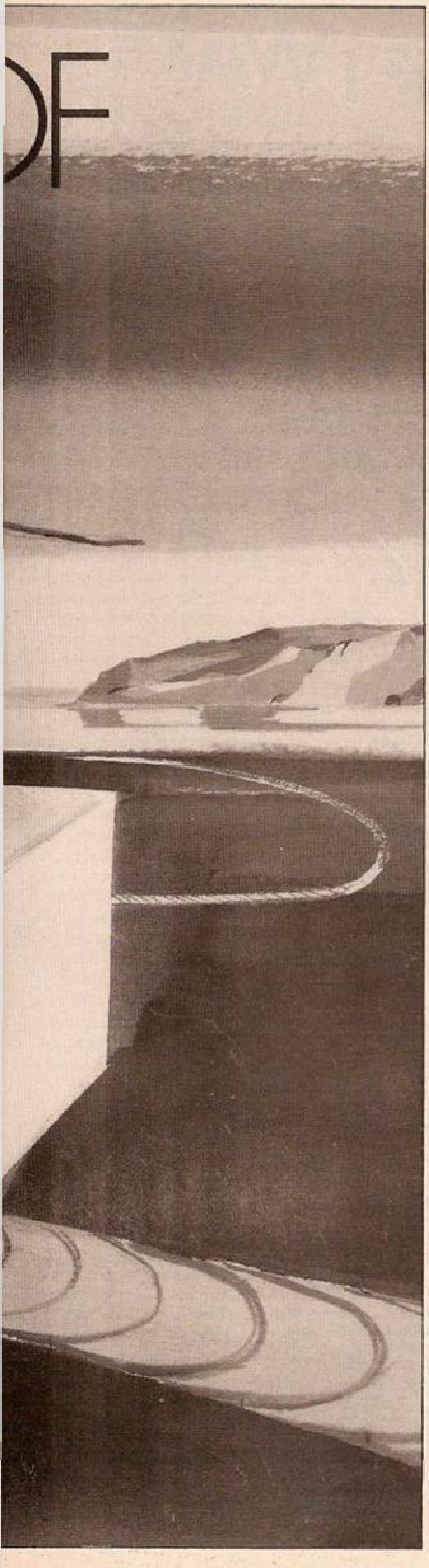
AN INTERRUPT is a signal sent to the microprocessor which generally suspends the execution of the current program — without the program knowing it.

Every 20 ms the Z-80 processor in the Spectrum receives an interrupt which forces it to suspend what it is currently doing and to jump to 38 hexadecimal or 56 decimal where it increments the system variable frames and scans the keyboard so that the Spectrum knows what you are keying in, if anything. If this interrupt could be diverted elsewhere to a user routine it would provide a very powerful facility which would have almost limitless uses. The way in which the Z-80 responds to an interrupt is governed by which interrupt mode it is operating in; the Z-80 has three modes.

Interrupt mode 0 allows the interrupting device to place one instruction on to the data-bus after the interrupt for execution by the Z-80. Interrupt mode 1 makes a jump to 38hexadecimal or 56 decimal and this is the mode that the Spectrum uses. Interrupt mode 2 is more complex. When the Z-80 receives an interrupt, it expects the interrupting device to place one byte of data on the data bus which acts as the low order of an address. The high order of the address comes from the I register. The Z-80 looks at this address which gives it a second address that it then jumps to.

The last mode provides a method of diverting the Z-80 to a user routine for, although the Spectrum does not provide the byte of data required, this means the Z-80

(continued on page 105)



16K mother program.

```
  10 REM Spectrum Interupts
  20 REM for 16k Spectrum
  30 REM ©N.DORE
  35 CLEAR 32329: LET c=0
  40 FOR i=32330 TO 1e9: READ a:
 IF a<256 THEN LET c=c+a: POKE i
,ABS a: NEXT i
  70 IF a<>c THEN PRINT "ERROR I
N PROGRAM": STOP
 100 REM ON/OFF routines
 110 DATA 62,40,237,71,237,94,20
1,0,0,0,62,62,237,86,237,71,201,
0
 120 REM SERVICE ROUTINE
 130 DATA 255,243,197,213,229,24
5,1,254,127,237,120,254,252,40,9
,205,144,126,241,225,209,193,251
,201,62,56,50,141,92,205,107,13,
1,254,127,237,120,254,252,40,247
,251,207,20,0,0,0,0,0,0,0,0
 140 REM User routine(here RET)
 150 DATA 201,9306
```

16K mother program Z-80 code.

```
ON ROUTINE
ld a,40             62 40
ld i,a              237 71
im 2                237 94
ret                 201
OFF ROUTINE
ld a,62             62 62
im 1                237 86
ld i,a              237 71
ret                 201
SERVICE ROUTINE
rst 56              255
di                  243
push bc             197
push de             213
push hl             229
push af             245
ld bc,32766         1 254 127
in a,(c)            237 120
cp 252              254 252
jr z,+9             40 9
call 32400          205 107 13
pop af              241
pop hl              225
pop de              209
pop bc              193
ei                  251
ret                 201
ld a,56             62 56
ld (23693),a        50 141 92
call cls(3435)      205 107 13
ld bc,32766         1 254 127
in a,(c)            237 120
cp 252              254 252
jr z,-9             40 247
ei                  251
rst 8(reports)      207
error break         20
```

Figure 5 This generates a moving landscape at the bottom of the screen which can be used in one of your own games. The speed at which the ground moves can be changed by Poking 23681 which should be followed by Poke 23672,0. This program should be saved before being run.

```
 140>REM moving land data
 150 DATA 56,120,92,33,129,92,70
,184,216,62,0,50,120,92,33,96,90
,6,160,126,254,0,32,7,54,56,43,5
```

ANIROG SOFTWARE



SEE US ON STAND 402 AT MIDLAND COMPUTER FAIR APRIL 28th-30th

XENO II

An E-XPANDE-D screen presentation with superb action packed space thriller, written entirely in machine code with four action packed stages. To destroy the power source of Xeno II, you have to fight off waves of robot attack, plasma bombing by the legions of the outer sanctum and finally attack the power source protected by a force field, continuous bombardment by guardians and blockading by wild whirling suicidal space ships. Truly a game for all arcadians.

JS 16K £7.90

CAVERN FIGHTER

All M/C version of SCRAMBLE. Lasers, bombs, continuous scoring and sound effects give all the thrills of arcade game. Pilot your space ship through the tortuous tunnels and caverns destroying enemy missile launchers, fuel dumps and airborne fire saucers. Four ships to complete mission. 10 skill levels.

KB/JS Unex. £6

CRAWLER

All M/C version of Centipede. Homing spiders, mushroom laying fleas and multi-direction travel makes this game fast and furious, with 10 skill levels.

JS Unexp. £6

PHARAOH'S TOMB

Once you enter, the only way out is with the aid of a key which unlocks the mystery of the Pharao's tomb. Beware of the mantraps the ancient Egyptians so painstakingly built. One false move and you will meet the same fate as befell other tomb robbers over thousands of years. A multi-screen big graphical adventure with M/C movements.

KB 16K £6.00

SEVEN PROGRAMS (VOL 1)

Hi-res games for the whole family. Board game Othello plus Bomber, Slalom, Bounce out, Lunar Docker, Memory and Snake.

KB Unexp. £6.00

DOTMAN

All M/C version of the popular arcade game. Excellent colour graphics and sound effects complete with fruits, tunnels, running and highest score.

KB/JS Unexp. £6

ZOK'S KINGDOM

Your starcruiser badly damaged in a meteor storm is forced to crash land on the planet ruled by ZOK, a time space generated image of Dracula. You are challenged to a battle of wits and endurance as the battle for survival starts in earnest in this big multi screen graphical adventure in hi-res graphics and M/C movements.

KB/JS 16K £6

SEVEN PROGRAMS (VOL 2)

Another Hi-res games pack for the family. Graphical Adventure, Goblins Gold, plus Dare Devil, Ghosts, Grand Prix, Breakout, Cobra and Minefield.

KB Unexp £6.00

KRAZY KONG

An E-EXPANDE-D screen, large graphics, rolling barrels, hammer, fireballs, lifts, handbags and umbrellas as you try to rescue the damsel Kong has abducted. Spectacular collapse of Kong's lair in the fourth screen. Uses all 21K of your expanded Vic for this 100% M/C thriller. Complete with high score table.

KB/JS 16K £7.90

GALACTIC ABDUCTORS

New arcade game with fully EXPANDED screen. Space hawks are abducting the humanoids and also dropping eggs. A big 16K action packed arcade thriller in 100% machine code, Hi-res graphics and multi skill levels.

JS 16K £7.90

FROGRUN

Popular arcade game. All machine code with brilliant colour graphics and sound effect. Features include snakes, crocodiles, lady frogs, turtles, cars, lorries and logs.

KB/JS Unexp. £6

DRACULA

Count Dracula is asleep somewhere in his castle. He rises at mid-night and you must find him and drive a stake through his heart before he rises. A multi-screen graphic adventure.

KB 3K £6

TINY TOT'S SEVEN

Super games pack for younger children with bright colour graphics and sound effects. Everybody's favourite Simon plus Super Snap, O's and X's, Word Jumble, Bomber, Duck Shoot and Mad Drivers.

KB Unexp £6.00

TRADE ENQUIRIES WELCOME, GENEROUS DISCOUNT

SOFTWARE WRITERS

We are looking for top class writers to join our growing software team. If you have written a quality game for VIC 20, SPECTRUM, DRAGON 32, ORIC 1 or COMMODORE 64, then contact us. We pay top royalties for accepted programmes.

BARCLAYCARD VISA — Access

24 HR.CREDIT CARD SALES HORLEY (02934) 6083

SPECTRUM - VIC 20 - ZX81 DRAGON 32

Huge selection of software. Nearly all the software advertised in this magazine available post free. Pick and mix facility. Order for yourself and friends and get huge discounts. Send S.A.E. for catalogue.

5 Tapes 10%. 10 Tapes 15%. 20 Tapes or more 20%.

PAYMENT BY CHEQUE, P.O.ACCESS/VISA

ANIROG SOFTWARE
26 BALCOMBE GARDENS
HORLEY, SURREY
ENQUIRIES HORLEY (02934) 2007/6083

(continued from page 102)

thinks it sees FFh or 255 decimal. Thus we need only change that I register so that the address

I*256+255

and the following one point to our user routine. However, the I register cannot be moved so that

I*256

is in RAM without causing screen interference.

Therefore we must find our vector address somewhere in ROM. A quick search finds suitable vectors for both 16K and 48K machines:

I=40

will produce a jump to 32348 for 16K machines,

I=9

will produce a jump to 65129 for 48K machines. In order to see what can be done with these interrupts first type in the mother program for your particular machine which allows all the following programs to be compatible between both machines. After typing in the program, Run it. If after a few seconds, an "Error in program" message appears, then carefully check the Data statements and try again. If "OK" appears then save the program as the checksum does not detect all possible errors. Here are the commands for turning the routine on or off:

ON
16K LET a=USR 32330
48K LET a=USR 65180
OFF
16K LET a=USR 32340
48K LET a=USR 65190

Turn the routine on. If the computer crashes, then re-load the program and check it carefully. If "OK" appears on the screen then the routine should be working. The mother program on its own adds one useful feature: the depression of symbol-shift and space together now acts as Break but with these added advantages. The new Break works in machine-code loops, it clears the screen and returns the colours to the normal black on white. The use of this break when not running a program causes a buzz with Colour Reset and Clear Screen.

To see what the routine can do, turn it off and add the lines in figure 1 erasing the original lines of the same line number. Make sure you have turned the routine off and Run the new program. Turn the routine back on and you will be greeted by a pulsating border display and a clicking sound which continues while your own programs are running.

You might like to try loading a Basic program off a cassette. The border display will stop during the load, as it will during Beep, for the computer disables the interrupts because timing is important. The border will start pulsating again as soon as the program has loaded. This program achieves its effect by outputting the contents of the frame counter to the port which controls the border 50 times a second.

The other five examples can be entered in the same way but remember to take great care that the old routine is turned off before running the mother program to enter the new routine. ■

```
4,0,35,0,35,16,241,42,121,92,35,
34,121,92,38,1,70,58,176,92,254,
1,40,23,58,177,92,203,64,40,4,60
,50,177,92,254,5,32,29,62,1,50,1
76,92,24,22,0,58,177,92,203,64,4
0,4,61
 160 DATA 50,177,92,254,1,32,6,6
2,2,50,176,92,0,58,177,92,71,17,
32,0,33,255,90,54,0,183,237,82,1
6,249,71,62,6,144,71,54,56,183,2
37,82,16,249,201,19586
 200 POKE 23728,1: POKE 23729,2:
POKE 23681,1:
```

48K Mother program

```
 10 REM Spectrum Interupts
 20 REM for 48k Spectrum
 30 REM ©N.DORE
 35 CLEAR 64911: LET c=0
 40 FOR i=65129 TO 1e9: READ a:
IF a=256 THEN LET i=64912: NEXT
i
 50 IF a<256 THEN LET c=c+a: PO
KE i,ABS a+(a<0)*127: NEXT i
 70 IF a+96<>c THEN PRINT "ERRO
R IN PROGRAM": STOP
 100 REM SERVICE ROUTINE
 110 DATA 255,243,197,213,229,24
5,1,254,127,237,120,254,252,40,9
,205,144,253,241,225,209,193,251
,201,62,56,50,141,92,205,107,13,
1,254,127,237,120,254,252,40,247
,251,207,20,0,0,0,0,0,0,0
 120 REM ON/OFF routines
 130 DATA 62,9,237,71,237,94,201
,0,0,0,62,62,237,86,237,71,201,2
56
 140 REM User routine(here RET)
 150 DATA 201,9306
```

Figure 1.

```
 140>REM border display
 150 DATA 58,120,92,211,254,201,
10041
```

Figure 2 This shows you how your Spectrum can generate sounds while you enter or run a program.

```
 140>REM sound
 150 DATA 42,120,92,203,61,38,0,
41,41,41,41,17,2,0,205,181,3,201
,10434
```

Figure 3 This makes the screen scroll automatically unless the n key is pressed.

```
 140>REM Non-stop scroll
 150 DATA 1,254,127,237,120,254,
247,200,62,5,50,140,92,201,11095
```

Figure 4 This provides an On Error Beep function. It causes the computer to beep when an error occurs until Enter is pressed.

```
 140>REM On error bleep
 150 DATA 58,58,92,254,255,200,1
7,150,0,33,100,0,205,181,3,243,2
01,11155
```

Figure 6 This last routine generates a display of the 24-hour clock at the top right of the screen. The computer will even beep on the hour, all while your own program runs. Save this program before running it.

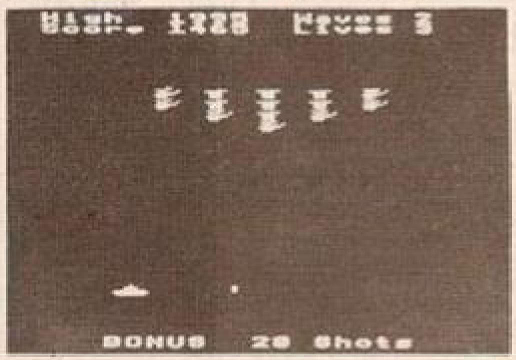
```
 140>REM clock data
 150 DATA 50,73,-127,50,[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
 160 DATA 126,254,7,40,222,0,[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
 170 DATA 17,21,64,[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
 175 DATA 33,21,88,6,10,[illegible]
[illegible]
[illegible]
[illegible]
,243,201,22160
 176 REM [illegible]
[illegible]
 180 DIM a$(10): INPUT "Hour ";h
,"Minutes ";m: LET a$=("0" AND L
EN STR$ h=1)+STR$ h+"0"+("0" AND
 LEN STR$ m=1)+STR$ m+"00000": F
OR i=1 TO 10: POKE i+32503+(PEEK
 23733>130)*32512,CODE a$(i)-47:
 NEXT i
 190 INPUT "key to start";a$: PO
KE 23672,0: LET a=USR ((PEEK 237
33<130)*32330+(PEEK 23733>130)*6
5180)
```

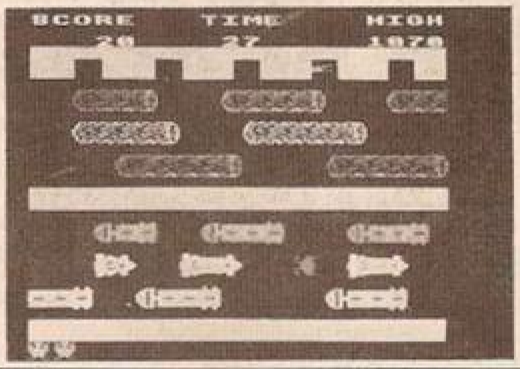
A + F SOFTWARE A + F



PAINTER – BBC SPECTRUM, ATOM
Completely machine coded Arcade game. 6 levels. 16 different screens. Runs in colour on the Atom without F.P. BBC cassette £8. Disk £11.50. Atom cassette £6.90. Spectrum cassette £5.75.

PLANES – BBC 32K
Spectacularly fast arcade style game. Options for different speed of game- even the slowest is fast! Many different screens and bonus scores. Graphics are really superb.
Cassette £8.00 Disc £11.50.





FROGGER – BBC & SPECTRUM
More arcade action for the BBC (as photo) and Spectrum. Get your frog across the road, use the logs to navigate the river and get home. Beware the crocodile and snake, collecting the lady frog gains valuable bonus points. Beat the time limit or die.
BBC Cass. £8.00 Disc £11.50.
Spectrum cassette £5.75.

ORIC
Two adventure games for the ORIC available NOW, Death Satellite and Zodiac. Both will run on the 16K machine. Cassettes at £6.90 per game.

DRAGON
Deadwood monopolies a western town — 1-4 Players, set your own time limit. Cassette £6.90.
Buccaneers — a piratical game again for 1-4 players Cassette £6.90.

ATOM

Space Panic	£6.90
Zodiac	£6.90
Death Satellite	£6.90
Cylon Attack	£6.90

Atom Utilikits still available from stock at £18.50.

SPECTRUM
Crazy Balloons — an excellent game for the 16K machine at £5.75.
Specfile — Stock control/data management system for the 48K machine £10.00.

BBC
Pharoah's Tomb — an interactive graphic adventure game for the Model B.
Cassette £8.00 Disc £11.50.
Tower of Alos another graphic adventure game — this will run on the A or B machine.
Cassette £6.90 Disc £11.50.

PLEASE NOTE THAT ALL OUR PRICES INCLUDE VAT & POSTAGE

5% DISCOUNT ON ALL SOFTWARE WITH THIS COUPON
(Quote 830/5 for discount on telephone orders)

NAME ______________________ PLEASE SEND ME:
ADDRESS ______________________

Please note prices include post & packing
You may also telephone (24 hrs) with credit card order

830 HYDE ROAD MANCHESTER M18 7JD
061-223 6206 (24 hrs) Telex 667461 (AHn A&F)

SINCLAIR SIRIUS SPECTRUM BBC DRAGON ATOM SINCLAIR SIRIUS SPECTRUM BBC DRAGON ATOM SINCLAIR SIRIUS SPECTRUM BBC DRAGON ATOM SINCLAIR SIRIUS SPECTRUM BBC DRAGON ATOM SINCLAIR SIRIUS SPECTRUM BBC DRAGON ATOM SINCLAIR SIRIUS SPECTRUM BBC DRAGON ATOM

VOICES OF THE VIC



While the Vic-20's four-channel sound facility is one of its most appealing features, do you really know how to make the most of them? John Ransley explores the electronic quartet's potential.

YOUR UNEXPANDED Vic-20 can make you feel like Richard Clayderman, Acker Bilk, John Williams or James Galway. But the big question often asked by Vic owners is, how? After all, my copy of Commodore's introductory manual manages to transpose whole chunks of instructions in that section briefly describing the micro's music-making capabilities — so anyone else attempting to exploit them might be forgiven for taking a powder and going for a long lie-down in a quiet darkened room.

So start again — from here, with some easy routines which I will explain as we go along. Incidentally, if your micro is not a Vic-20, you will find that it is still possible to foster many of these programs, usually by simply substituting for any Poke statements the equivalent Basic command in your micro's dialect, which will probably be something like Sound or Beep.

You can make creative use of at least three of the Vic's four sound generators, individually or collectively, and in several different ways. First, you can use them to play the Vic's keyboard like that of a piano or organ; secondly, the Vic can be a musician, playing itself the music you give it to learn, just as though it was an electronic pianola; thirdly, it can help you compose your own music by combining the two facilities just mentioned; fourth, the Vic can take over the actual composing and produce sonorous fugues or perky rags — and in all the programs that follow, I have incorporated some kind of screen display to help you understand even better what's going on in the Vic's mind.

The Vic's soundmakers slumber silently in four separate Poke locations: 36874, 36875, 36876 and 36877. The first three of these are always used, alone or collectively, to play music. The fourth, 36877, is the white noise generator — all of whose tones sound like nothing so interesting as an untuned radio until you start shaping them.

Of the three music voices, it is convenient to think of 36874 as being the lowest or bass voice; 36875 as the mid-range or tenor voice; and 36876 as the highest, or soprano. Each of these three voices has a library of 126 tones numbered 128 to 254 inclusive, covering some three octaves of the conventional music scale. Poke 36874 drops an octave lower than, and Poke 36876 an octave higher than, Poke 36875. Therefore, you have something like a five-octave range across the three voices.

The only other Poke location you will need is 36878, which is qualified by a number from 0 to 15. This command switches on the volume control and sets the sound level. You may find that the highest setting distorts when played through the speaker of your particular TV or monitor; Poke 36878,10 or Poke 36878,12 should be about right most times.

Type New, hit Return, and enter Program 1. Run this, and you hear each of the 127 tones held in the Vic's bass voice, and see its number displayed on-screen. Everything stops at 254 except the noise. Hit Run, Stop and Restore, then List Program 1. Tone 254 continued because I did not include a line cancelling the volume. So add these lines:

```
170 POKE 36878,0
180 POKE 36874,0
```

It is not strictly necessary to include line 180 in this program, but if you do not the old voice will stay live and still be heard behind any other voice Poked.

Each of the three Poke locations is capable of generating 126 notes. Change line 130 in Program 1 to Poke 36875,T and Run; and then to Poke 36876,T and Run to hear the tenor and soprano equivalents respectively. With these, the two or three uppermost tones are at such a high frequency that you may not even be able to hear them.

At this stage, it is important to draw a distinction between tones and notes, because only 25 of the tones in each Poke location are more or less equivalent to the notes ABCDEFG of the conventional musical scale. And to complicate matters, they match up in uneven steps. For example, note E is tone 206, F is 209 and F# is 211. The whole range of 126 available tones thereefore gives you just three octaves, from a low C on tone 131 to a high C on tone 224.

This next simple program proves the Vic's ability to produce an orderly musical scale of eight notes — C major. New the memory and enter Program 2. In this program, lines 110 to 130 set up a store cupboard of tones equivalent to the scale of C major and their names; count up the pairs and you will find they total eight in number. Lines 140 and 160 form a loop that makes line 150 read through each Data pair and store them in memory as matched sets tagged 1 to 8.

At line 170, the Vic is waiting for you to tell it which pair you want brought up front, by touching any one of the keys numbered 1 to 8 on the top row of the keyboard; the second half of line 170 makes the Vic go round in circles until you do so.

Line 180 takes the value of the key you have touched and marries it up with the Data pair tagged with that same number. So if you hit key 4, the fourth pair along in the Data queue — which happens to be 232,F — gets yanked out and put to work. On goes the volume in line 190, and line 200 selects the tenor voice and drops in the (N)ote line 180 produced. The other half of the pair, the actual letter C,

(continued on next page)

(continued from previous page)

then neatly drops into the Print statement in 210. So as you touch each key, you will hear a note in C major ranging from the lowest (triggered by key 1) to the highest (key 8), and receive visual confirmation of the note the Vic played. If you want to temporarily mute the sound, touch the space bar — or indeed, any key other than 1 to 8.

You can give yourself a little more self-tuition in equating the Vic's tone numbers with actual note values by expanding a little on the Data items. Just as an experiment, retype line 110 of Program 2 as follows:

110 DATA 225,C (225), 228,D (228), 231,E (231)

Run this revised version and when you hit key 1, 2 or 3 the screen will display not only the note name as before but also, in brackets, the tone number used to produce that note. This can be a useful aid when you are compiling Data statements from sheet music.

Before moving on to programmed music, using Data statements as scores on which the Vic can work, let us try brightening up the general sound produced by Program 2. Program 3 will teach you a new technique for shaping the character of the Vic's voices, as well as producing a new tune.

As you are now entering the realm of longer and more complicated Data queues, perhaps it is worth mentioning the most common reasons why the Vic flashes up the dreaded Out of Data error message. One is that you have missed out a comma somewhere; there must be one after every Data item except the last in any one Data line. Another is that you have typed a letter O instead of the special slashed zero, 0. Out of Data will also show up if the number given in the Read loop does not match the number of items in Data.

Finally, if you are adapting any of these routines to use in a more ambitious program, remember that you may have to set up a Dim statement to reserve memory for the Read array. If you do not, you may prompt the Bad Subscript error message.

Back to the music. Again, New the memory, and carefully type in Program 3. This sounds a little more like a piano, thanks to lines 170 to 200. These ensure that the volume of each note is heard at full volume and then dies away to nothing after the time allowed to play the (L)ength of the note in line 190. If you would like to prove to yourself that this is really happening, just add this one line to the program:

205 PRINT " [CLR SCR] " N; D; L

If all is well, the screen will display a different tone number for each note that is played, then the digit 0 and the number 31. Check through the logic of Program 3 and you should be able to understand why.

This exercise also introduces a couple of other little tricks. First, perhaps you noticed the dummy value of 0 at the end of line 120. That is because, unlike Program 2, the Read statement in line 140 simply starts at the first item of Data and doggedly works its way right through the queue, item by item. The 0 signals to the second part of line 140 that the notes are all used up and so the tune is over. Without it, the program would jam on the last note and flip up the news Out of Data Error in

(continued on page 111)

Program 1.

```
100 REM PROGRAM 1
110 POKE 36878,10
120 FOR T=128 TO 254
130 POKE 36874,T
140 PRINT T,
150 FOR D=1 TO 400
160 NEXT D:NEXT T
```

Program 2.

```
100 REM PROGRAM 2
110 DATA 225,C,228,D,
    231,E
120 DATA 232,F,235,G,
    237,A
130 DATA 239,B,240,C
140 FOR N=1 TO 8
150 READ S(N), N$(N)
160 NEXT N
170 GET K$:IF K$=""
    THEN 170
180 N=VAL(K$)
190 POKE 36878,10
200 POKE 36875, S(N)
210 PRINT"[illegible]
  YOU HIT NOTE ";N$(N)
220 GOTO 170
```

Program 4.

```
100 REM PROGRAM 4
110 DATA 215,400,217,
    600,215,400,209,
    600,207,400,209,
    600
120 DATA 215,400,221,
    600,217,400,215,
    600,209,400,217,
    600
130 RESTORE
140 READ N:IF N=0
    THEN220,0
150 READ D
160 POKE 36875,N
170 POKE 36878,10
180 FOR L=1 TO
    D:NEXT L
190 POKE 36878,0
200 GOTO 140
210 POKE 36874,
    0:POKE36878,0
220 END
```

Program 7.

```
100 REM PROGRAM 7
110 N=INT(RND(1)
    *30)+195
120 POKE 36878,10
130 POKE 36875,N
140 PRINT"I'M PLAYING
    TONE";N
150 FOR D=1TO400:
    NEXT D
160 POKE 36878,0
170 GOTO 110
```

Program 6.

```
100 REM PROGRAM 6
110 N=INT(RND(1)
    *129)+126
120 POKE 36878,10
130 POKE 36875,N
140 PRINT"I'M PLAYING
    TONE";N
150 FOR D=1TO400:
    NEXT D
160 POKE 36878,0
170 GOTO 110
```

Program 5.

```
100 REM PROGRAM 5
110 DATA 201,800,209,400,225,1200,221,
    800,209,400,203,1200
120 DATA 201,800,201,400,201,400,203,
    400,209,400,215,1200,209,1200
130 DATA 201,800,209,400,225,1200,221
    ,800,209,400,203,1200
140 DATA 201,800,209,400,209,400,215,
    400,219,400,221,1200,221,1200,5
150 RESTORE
160 READ N:IF N=5 THEN 220
170 READ V
180 POKE 36878,10:POKE36876,N
190 FOR D=1 TO V:NEXTD
210 GOTO 160
220 POKE 36876,0:POKE 36878,0
230 END
```

AMSOFT

OPERATING AND CONTROL SYSTEMS FOR DISCERNING ZX81 AND SPECTRUM USERS

All **AMSOFT** products are designed to help users get the most out of their machines. No additional hardwae is needed to run them, but they can support other devices if needed.

AM-ZXFILE allows you to use large cassette data files in BASIC programs, with no limit on file size, and input/output in the same program, like a big machine. For ZX81 at £4.00, and Spectrum at £5.00.

AM-ZXMON is the operating system which allows you to develop, edit, run, and checkpoint machine code programs, and to create and use libraries of machine code routines on tape, saving hours of work.

ZX81 version £6.00, and Spectrum version £7.00.

Under the control of **AM-ZXMON** you can run **AM-ZXEDIT**, a text editor for creating and editing assembly language source code, for input to **AMAZON**, a full assembler which creates machine code tape files. User symbols, hex., decimal, and string constants, and saving/re-use of symbol tables are among the features.

AM-ZXEDIT for **ZX81** and **Spectrum** £4.00. **AMAZON** for ZX81 £8.00, available for Spectrum late April at £8.50.

NEW! **AM-ZXSP** takes a saved **ZX81** program tape and loads it into a SPECTRUM leaving it ready to run, edit or save. No more retyping of programs when you change machines. Available now at £6.50.

All our prices include VAT.

AMERSHAM SOFTWARE LTD.
Long Roof, Hervines Rd.,
Amersham, Bucks. HP6 5HS
(02403) 6231

VIEWPOINT

THE PROGRAM THAT YOUR ZX SPECTRUM HAS BEEN WAITING FOR!

Draw complex 3-dimensional objects. View them after rotation in any or all of 3 dimensions.
Features:

1) **Rotation in 3 dimensions about a single point.**
2) **Rotation about a line between two points.**
3) **Generation of stereo pairs.**
4) **View from one point towards another point.**

Objects can be stored separately on tape and copied to the ZX printer.
Written in BASIC for you to modify to your own requirements.
Ideal for computer modelling, molecular modelling, CAD etc.

Viewpoint - with full instruction and examples
£6.50

Just starting to write machine code programs? The ideal assembler for beginners is Ultraviolet. Look at the facilities that it offers:

Works entirely in decimal (no hex problems); all Z80 instructions correctly assembled; supports the pseudo-instructions EQU, ORG (multiple ORGs allowed), DEFB, DEFW and DEFS; code can be assembled at one location and then relocated; allows alphanumeric labels of any length; full listings of assembled code and mnemonics can be output to the printer; full error trapping with faulty instruction clearly indicated; comments can be included in the source file.

The ideal complement to Ultraviolet is Infrared - an easy-to-use disassembler.

So now there is no need to be intimidated by machine code - with Ultraviolet and Infrared it's child's play! Buy them from the machine code specialists - ACS Software.

ULTRAVIOLET - £7.50 **INFRARED - £6.75**

All our Spectrum programs will work in both 16K and 48K models.

ANNOUNCEMENT: All three programs now available for the 16K ZX81!!

ACS SOFTWARE 7, Lidgett Crescent, Roundhay, Leeds LS8 1HN

ACS

DON'T MISS THIS INCREDIBLE OFFER!

50 GAMES £9·95



YES, 50 GAMES! on cassette for all the following:

GALACTIC ATTACK	MAZE EATER	SUBMARINES
SPACE MISSION	ORBITTER	ROCKET LAUNCH
LUNAR LANDER	MOTORWAY	PLANETS
PLASMA BOLT	FORCE FIELD	BLACK HOLE
STARTREK	NIM	DYNAMITE
RADAR LANDING	TUNNEL ESCAPE	DO YOUR SUMS
ATTACKER	BARREL JUMP	DERBY DASH
GALACTIC DOGFIGHT	CANNONBALL BATTLE	SPACE SEARCH
ZION ATTACK	OVERTAKE	UNIVERSE
IVASIVE ACTION	SITTING TARGET	RATS
OXO	SMASH THE WINDOWS	TANKER
BOGGLES	SPACE SHIP	PARACHUTE
PONTOON	JET FLIGHT	JETMOBILE
SKI-JUMP	PHASER	HIGH RISE
HANGMAN	INTRUDER	THE FORCE
OLD BONES	INFERNO	EXCHANGE
THIN ICE	GHOSTS	

sinclair SPECTRUM
apple (ON DISC & CASSETTE)
ACORN ATOM
BBC
DRAGON
ATARI VIC 20
SHARP
ORIC-1
NEW BRAIN
ZX81 LYNX



POSTAGE FREE TO U.K. ORDER DIRECT TO:

U.T.S.
P.O. Box 96
HARROGATE
NORTH YORKSHIRE
HG3 2UZ

PLEASE SEND ME ____________
CHEQUE ENCLOSED, VALUE ________
NAME ____________
ADDRESS ____________
POSTCODE ________ G/224

cut & post now

(continued from page 108)
140. If you like, try this for yourself by cursoring out the dummy zero and then Running the program.

Secondly, the Restore statement in line 130 is not strictly necessary in this particular program as you have to rerun it every time you want to hear the music anyway. But usually, you will want to set Read's pointer to the head of the Data queue in line 110 in case you want to call it again; Restore does just that.

Before we go on to refine Program 3 by giving each of the notes proper values, do not overlook the creativity which lines 170 to 200 offer you. You can tinker with these along with lines 150 and 160 to get a sound more like a bar-room piano than a Bechstein, for example. Lower the 15 to 0 range of line 170 and you will soften the apparent attack; alter the Step value in the same line — even to a decimal such as .25 — and you can remould the sustain and rate of decay.

You could try adding 36876 as well, or trying different combinations of the three. Further, changing the value of the delay loop in line 190 alters the overall speed at which all this happens. This little suite of three variables is one of the most powerful tools you have in exploiting the Vic's soundmaking potential.

So Program 3 opened some new horizons, but to hear the music played properly, we need to pair every note in the Data queue with a value representing its proper duration, just as we added the letters of the scale in Program 2.

Tidy the Vic's memory by typing New and hitting Return, and this time we will have James Galway audition for Dooley Wilson's job at the Café Américain in program 4.

The deliberate error is at line 190. That Poke is chopping up the notes in a way that a flautist certainly does not do. So delete line 190 altogether and Run the program again. Now the notes do glide into one another as they should.

In this exercise I have used a value of 3,000 to the bar. It is an easy matter to quicken or slow the overall tempo at which this or any other tune is played, by simply changing proportionally the value given to each D item in Data. Thus you could accelerate Mr Galway by changing 400s to 300s, and the 600s to 450s, and so on.

But beware, this deceptively easy program has a trap for the unwary. New memory and enter Program 5.

When you Run this program, all will be well until you hear the Vic play those notes in lines 120 and 140 which are the same in tone, if not duration, of those preceding them. Just drop in a pair of zeros to achieve an imperceptible break. You may use this same trick to imitate the rests shown on sheet music. You can specify the length of the rest by giving N a proper value to work on. As an example:

```
DATA 201,400,0,200,201,400
```

will sound tone 201 for, say, a half-note; then introduce a quarter-note rest; and then play 201 for another half-note. You may also have noticed that the end of data signals at the end of lines 140 and 160 were changed to 5 from the usual 0, so that when you correct this program by adding double zeros to lines 120 and 140, your program will not end prematurely. You can go on qualifying Data lines with yet more items, provided that they are always in logical sets.

You might, for example, have the notes and durations for a melody line as elements one and two in a four item set; with a bass line and associated note durations or rests as the third and fourth elements. This way you can achieve a very effective syncopated or walking bass rhythm. For a demonstration of this technique, I can do no better than refer you to Adam Macielinski's ingenious boogie programs in the March 1983 issue of *Your Computer*. Adding the Vic's third voice will give you three-part harmony in a carefully structured Data queue comprising six-element items; and maybe now is the time to experiment more with Poke 36877 to drop in a snare drum.

After all that your fingers could do with a rest, so why not let the Vic get on with some composing of its own. Program 6 generates a random number between 128 and 254, which becomes the tone qualifier for line 130; and line 140 prints it out for you. The tone plays for a time set by the loop in 150 and the program then loops back for its next randomiser to give a continuous demonstration of *musique silicon* if not *concrète*.

The snag is that line 110 draws from too wide a choice of tones, many of which do not equate to real musical notes anyway. You can improve matters a little by reducing the choice for N to, say, just one middle octave. Make this alteration:

```
100 REM PROGRAM 7
110 N + INT(RND(1)*30) + 195.
```

Better, but you are still hearing some bum notes that make it sound rather strange. The best solution comes with our old friend the Data statement. New memory and enter Program 8.

Here, lines 110, 120 and 130 set up a single octave of C major while 150 generates at random a number between 1 and 8; line 160 puts this on-screen. The volume is set in line 170, and 180 delves into the Data queue at that position fixed by R. Line 200 gives a moment of silence before looping back for the next cycle.

This program will generate music that sounds more "true" — now it is just plain monotonous thanks to line 190 sounding each note for precisely the same length of time. But it is an easy matter to introduce a further randomiser which will select different note values — the length and relationship of which you can fix. Revise the last program by changing it as follows from line 190 onwards — see Program 9.

Not stunningly elegant but it does the job. The values at the end of lines 210 to 240 you can tinker with yourself; the lower the numbers, the faster the music.

There is very much more to music making and computerised composing on your Vic 20 — not to mention the sound effects capabilities which I have not got around to examining here in any detail. Still, I hope you have fun trying, testing and adapting the programs given here and that they will help you to develop the know-how and curiosity that can result in some really original efforts of your own — ones worth listening to, as well! ■

Program 8.

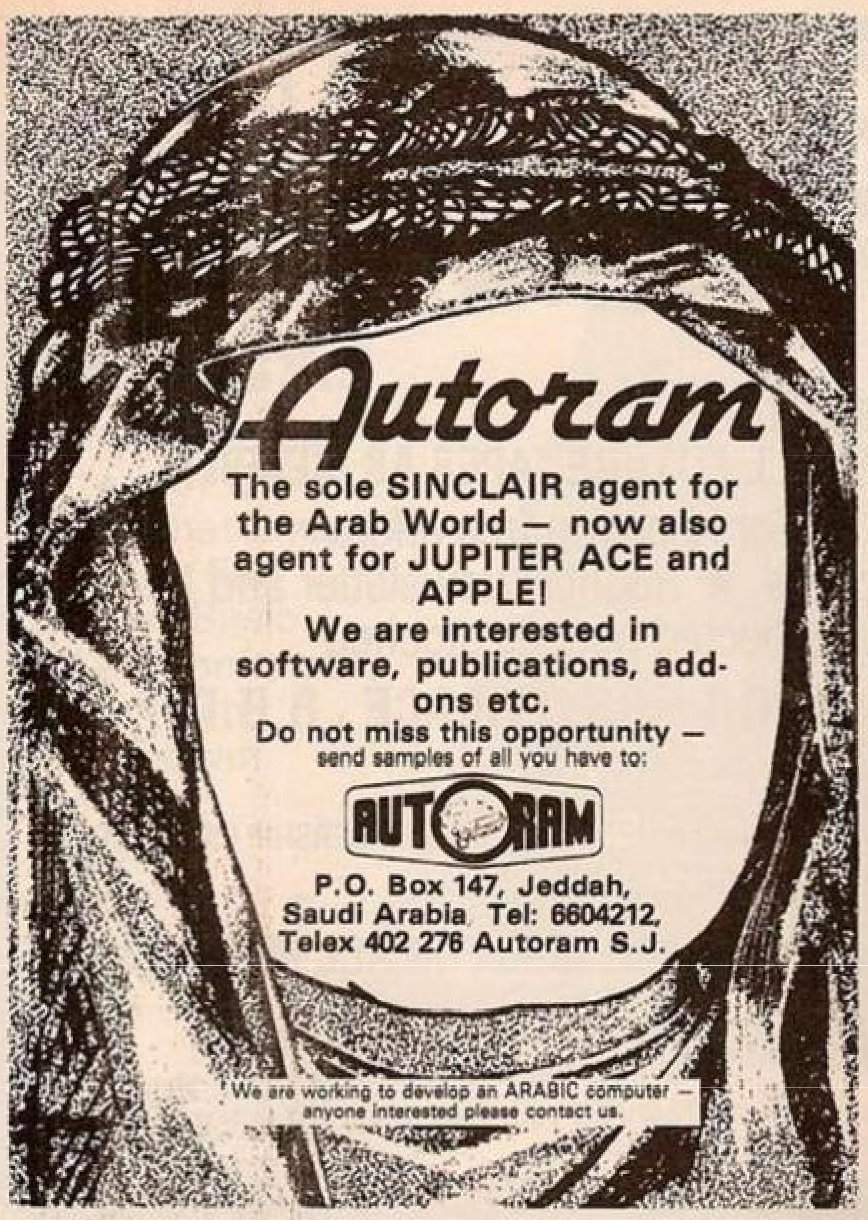
```
100 REM PROGRAM 8
110 PRINT"J"
120 DATA 195,201,
    207,209,215,
    219,223,225
130 FOR N=1 TO 8
140 READ S(N):NEXT N
150 R=INT(RND(1)*8)+1
160 PRINT R;
170 POKE 36878,10
180 POKE 36875,S(R)
190 FOR D=1 TO 600:
    NEXT D
200 POKE 36878,0
210 GOTO 150
```

Program 3.

```
100 REM PROGRAM 3
110 DATA 215,217,215,
    209,207,209
120 DATA 215,221,217,
    215,209,217,0
130 RESTORE
140 READ N:IF N=0
    THEN220
150 POKE 36874,N
160 POKE 36875,N
170 FOR D=15 TO 1
    STEP -1
180 POKE 36878,D
190 FOR L=1 TO 30
200 NEXT L:NEXT D
210 GOTO 140
220 POKE 36874,0:POKE
    36875,0:POKE
    36878,0
230 END
```

Program 9.

```
100 REM PROGRAM 9
110 PRINT"J"
120 DATA 195,201,207,
   209,215,219,223,225
130 FOR N=1 TO 8
140 READ S(N):NEXT N
150 R=INT(RND(1)*8)+1
160 PRINT R;
170 POKE 36878,10
180 POKE 36875,S(R)
190 V=INT(RND(1)*4)+1
200 PRINT V;
210 IF V=1 THEN L=150
220 IF V=2 THEN L=250
230 IF V=3 THEN L=350
240 IF V=4 THEN L=450
250 PRINT D;
260 POKE 36878,10
270 FOR D=1 TO L:NEXT
280 POKE 36878,0
290 GOTO 150
```



campbell systems

THE VERY BEST IN MACHINE CODE FOR THE **ZXSPECTRUM & ZX81**

All programs supplied double-recorded and mailed 1st class by return. Prices include VAT and postage within Europe. SAE for full list.

for 48K Spectrum **MASTERFILE** business/domestic filing and reporting system. So flexible that it is equally usable for your mailing lists, catalogues, stock control, text extracts ...... applications are endless. Fully user defined data and report display formats, dynamic variable-length file, records and data items. Fully menu driven with powerful search facilities, sorting, total/average, update, multiple independent files, printing. Yes, we aim to support microdrive when Uncle delivers. Nearly all the 8K we use is machine code, so you get 32K per file. Comes with example file and 22 page manual. £15.00

NEW Masterfile-16 for 16K Spectrum owners. We have produced a subset version of MASTERFILE called MASTERFILE-16. It has most of the features of big MASTERFILE, with 7 pre-defined report formats and 6 pre-defined fields e.g. name, address, etc., and we have found a useful 4500 bytes of file space. MASTERFILE and MASTERFILE-16 are fully 'file-compatible' and will happily process each other's files, so that 16K owners who upgrade to 48K can use their old files immediately. Complete with 12-page manual, priced at £12.00.

PLEASE REMEMBER TO STATE CLEARLY WHICH VERSION OF MASTERFILE YOU REQUIRE.

for 16K Spectrum **GULPMAN** game of the '...man' variety with 15 mazes, 4 chasers, laser defence, 9 grades, 9 speeds, demo mode, choice of joystick control. "An extraordinarily good program" raves Boris Allan for Popular Computing Weekly. We think you will agree. £5.95

for 16K ZX81 **GULP 2** almost identical spec to GULPMAN. £4.75

for 16-64K ZX81 **THE FAST ONE** is the predecessor to MASTERFILE and is in use all over the world now. Specification is very similar to MASTERFILE. £12.00

Campbell Systems, Dept.(YC),
15, Rous Road, Buckhurst Hill,
Essex, IG9 6BL, England.
Telephone: 01-504-0589

CS

SPECTRUM AND ZX81 HARDWARE

PANDA



The famous Panda Expandable Ram Pack. Massive 16K add-on memory which can easily be expanded to 32K with an optional plug-in module. Supplied in rugged no-wobble design, rugged, injection moulded case, contoured to fit the ZX81 snuggly. Compatible with other add-ons (printer etc). LED on/off indicator. No additional power needed just plug in an go. British designed and made from top quality components throughout, guaranteed 12 months. **ONLY £19·95**

EXPANSION MODULE ONLY £14·50

The 16K 'Panda' is easily expanded from 16K to 32K by adding this expansion module as and when you need it.

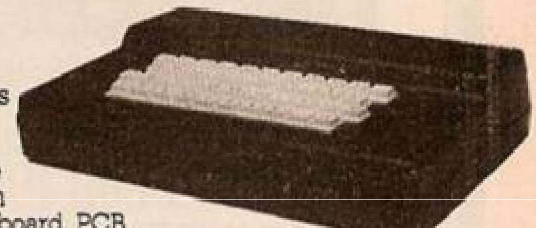


GIANT PANDA

Giant Panda the two together. Buy the Panda and the Expansion Module at the same time for a gigantic 32K bytes and save. Complete at a special price of **ONLY £34·00**

PROFESSIONAL CASED KEYBOARD TYPE FD42

FOR ZX81 OR SPECTRUM



This famous, best selling product immediately converts your ZX Computer into a sturdy, attractive and professional unit, with full size typewriter keyboard. A tough plastic case encloses the keyboard, PCB and power supply. It has 42 keys including all the ZX81/Spectrum graphic characters printed on them. The full travel key switches have gold plated contacts and guaranteed life of 10^6 operations. It's so easy to install! You simply unscrew the ZX PCB from it case, screw it to the FD case, and plug in the keyboard. No soldering or technical knowledge required **ONLY £29·00**

TYPE FDS FOR ZX81 OR SPECTRUM

Our new advanced keyboard has the same, fine specifications as the FD42 system, but with a new re-designed case, space bar and double-sized shift and enter keys. A must for the discerning ZX81 or Spectrum user. **ONLY £39·95**

ZX KLIK – KEYBOARD



If, like many ZX81 users, you are fed up with the dead feel of the touch sensitive keypad then consider the well tried 'Klik-Keyboard'. This is a simply fitted genuine push button keyboard which has been designed as an exact replacement for, and is no larger than, the existing keypad. ■ Fits on to the ZX81. ■ Full 40 keys plus one spare for any purpose. ■ No soldering – just plug in. ■ No trailing wires. ■ Clear permanent two colour legends. ■ Positive feel and sound as data is entered. ■ Speeds up programming enormously and reduces errors. ■ Fitting service offered £2·00 extra (remember to send your ZX81). **ONLY £24·50**

AFDEC ELECTRONICS LTD Kempshott Lane, Basingstoke Hants RG22 5LT

I wish to order the following:

Quantity	Item	Amount
	Panda @ £19·95 inc.	
	Expansion Module @ £14·50 inc.	
	Giant Panda @ £34·00 inc.	
	FD 42 Keyboard ZX/Spectrum* @ £29·00 inc.	
	FDS Keyboard ZX/Spectrum* @ £39·95 inc.	
	ZX Klik-Keyboard @ £24·50 inc.	
	TOTAL *Please Indicate.	

All prices include VAT and post and packaging. All items include a full year guarantee. Products are stocked and usually despatched within 10 days. Overseas customers add £4 post and packing. Cheques/Postal Orders etc. should be made payable to AFDEC Electronics Ltd.

Card No. ____

Signature ____ DINERS CLUB INTERNATIONAL

Name ____

Address ____

YC5

FINE SCROLLING

ATARI

Flashing junk, nasty jerks: two of the problems that arise when using fine scrolling in Basic. Chris Lam looks at ways in which Atari users can circumvent unpleasant experiences.



WHAT IS THE difference between fine scrolling and coarse scrolling?

Coarse scrolling is where one character at a time moves. This gives a very jerky effect. Type in program 1 and Run it. The program manipulates LMS operands to implement the coarse scroll. Any method can be used: it is just that LMS manipulation is easier. The program tells Antic — the graphics processor — where to start displaying data from. It runs through addresses 0 to 65535. We will call the addresses which are Poked to tell Antic where to start displaying screen data, DList and DList+1. Try steps of 19, 20 and 21 in line 30. Change lines 20 and 30 so that they run from 255 to 0.

Just for those who do not know what LMS operands are, LMS — load memory scan — is an instruction followed by a 16-bit address. The address of the low byte is

PEEK (560) + 256*PEEK(561) + 4

Now for fine scrolling. Add program 2 to program 1. There are two built-in scroll registers HScrol — 54276 — and VScrol — 54277 — which hold the number of pixels to be scrolled. The direction of the scroll depends on the sequence of numbers we Poke into it. Before these registers can be deployed, we have to enable the lines on the screen for fine scrolling. Lines 12 and 13 do this. In line 12, the 64 is the LMS instruction, 16 is the horizontal fine scroll enabler — 32 is the vertical scroll enabler — and 7 is the Antic number for graphics 2. Number 6 is for graphics 1, and 2 is for graphics 0.

The registers can only be used to scroll up to 15 pixels either way. Therefore we must combine fine scrolling with coarse scrolling.

Line 58 is the loop which determines the direction and the extent of scroll. A "0 to limit" gives an upwards or left-to-right scroll while a "limit to 0 step-1" gives a downward or right to left scroll. Look at figure 1 to determine the value of limit.

Line 62 resets the screen to its starting position before the coarse scroll. The value to be Poked is always the first number in line 58.

(continued on next page)

Program 1.

```
5 GRAPHICS 2+16
10 DLIST=PEEK(560)+256*PEEK(561)
11 DLIST=DLIST+4
20 FOR N=0 TO 255
30 FOR M=0 TO 255
40 POKE DLIST,M
50 POKE DLIST+1,N
60 FOR DELAY=1 TO 100:NEXT DELAY
70 NEXT M:NEXT N
80 END
```

Program 2.

```
5 GRAPHICS 2+16
10 DLIST=PEEK(560)+256*PEEK(561)
11 DLIST=DLIST+4
12 POKE DLIST-1,64+16+7:REM EXTRA LINE
13 FOR N=2 TO 13:POKE DLIST+N,16+7:NEXT
   N:REM EXTRA LINE
20 FOR N=0 TO 255
30 FOR M=0 TO 255
40 POKE DLIST,M
50 POKE DLIST+1,N
58 FOR J=7 TO 0 STEP -1:REM EXTRA LINE
59 POKE 54276,J:REM EXTRA LINE
60 FOR DELAY=1 TO 100:NEXT DELAY
61 NEXT J:REM EXTRA LINE
62 POKE 54276,0:REM EXTRA LINE
70 NEXT M:NEXT N
80 END
```

Program 3.

```
5 GRAPHICS 2+16
6 D=PEEK(560)+PEEK(561)*256
10 GOSUB 100
11 ACT=USR(ADR(A$))
12 POKE D+3,64+32+16+7
13 FOR N=2 TO 13:POKE D+4+N,55:NEXT N
14 POKE D+18,65
15 POKE D+19,PEEK(560)
16 POKE D+20,PEEK(561)
18 POKE 1536,15
```

(listing continued on next page)

(continued from previous page)

Before going on, see if you can convert the program to do a vertical fine scroll downwards.

Two problems arise with using fine scrolling on Basic. First is the flashing junk. Second is the unpleasant jerks. Both can be cured by changing scroll registers and LMS operands during the time which the screen is blank.

Type in program 3. The routine is enclosed in lines 101 onwards. This routine is executed fifty times a second exactly. You have to feed the routine with information.

POKE 203, number of pixels to scroll horizontally.
POKE 204, number of pixels to scroll vertically.
POKE 205, low byte of new start of screen RAM.
POKE 206, high byte of new start of screen RAM.
POKE 207, low byte of DLIST.
POKE 208, high byte of DLIST.
POKE 209, if Poked with a non-zero number it will load the LMS operands with what is in location 205, 206.
POKE 1536, number you would normally have on line 73 of program 2. This is the horizontal one.
POKE 1537, number you would normally have in line 73 of program 2. This is the vertical one.

This routine caters for horizontal and vertical scrolling. Program 3 demonstrates diagonal scrolling. Use this routine in your programs. You are probably saying to yourself "Who wants to watch a load of scrolling junk?". If you set up a string and manipulate LMS operands to point to the start of the string, then changing the contents of the string, we can implement coarse scroll. Try program 4.

The last program gives the skeleton on which the scrolling map in Eastern Front 1941 is created. Use your joystick to scroll the screen over nine screens full of random characters. A final warning. The computer has an internal character set which is not the same as the standard one. Such maps require a lot of careful planning before they can be created. This is all possible because screen data is not fixed to one section of memory but can be anywhere. Imagine how difficult it would be if you had to move all the data through screen ram. Program 5 uses twelve LMS instructions which is the proper set up for horizontal scrolling.

Why not try replacing MAP$ with your own graphics? ■

Figure 1.

Graphics mode	0	1	2	3	4	5
Horizontal 1 unit	3	7	7	3	1	1
Vertical 1 unit	7	7	15	7	3	3

```
19 POKE 1537,15
20 FOR I=255 TO 0 STEP -1
40 FOR J=255 TO 0 STEP -22
42 POKE 205,J:POKE 206,I:POKE 209,1
50 FOR N=15 TO 0 STEP -1
57 POKE 204,N
58 POKE 203,N
59 FOR K=0 TO 20:NEXT K
60 NEXT N
70 NEXT J
80 NEXT I
90 STOP
100 REM DATA
101 DATA 165,209,240,25,160,0,165,205,145,207,
    200,165,206,145,207,173,0,6,133,203
102 DATA 173,1,6,133,204,169,0,133,209,165,203,
    141,4,212,165,204,141,5,212
109 DATA 76,98,228
110 FOR N=0 TO 41:READ A:POKE 1538+N,A:NEXT N
120 DATA 160,2,162,6,169,7,32,92,228,104,96
130 DIM A$(11)
140 FOR N=1 TO 11:READ A:A$(N,N)=CHR$(A):NEXT N
150 CO=D+4
160 POKE 208,INT(CO/256)
165 POKE 207,CO-INT(CO/256)*256
170 RETURN
```

Program 4

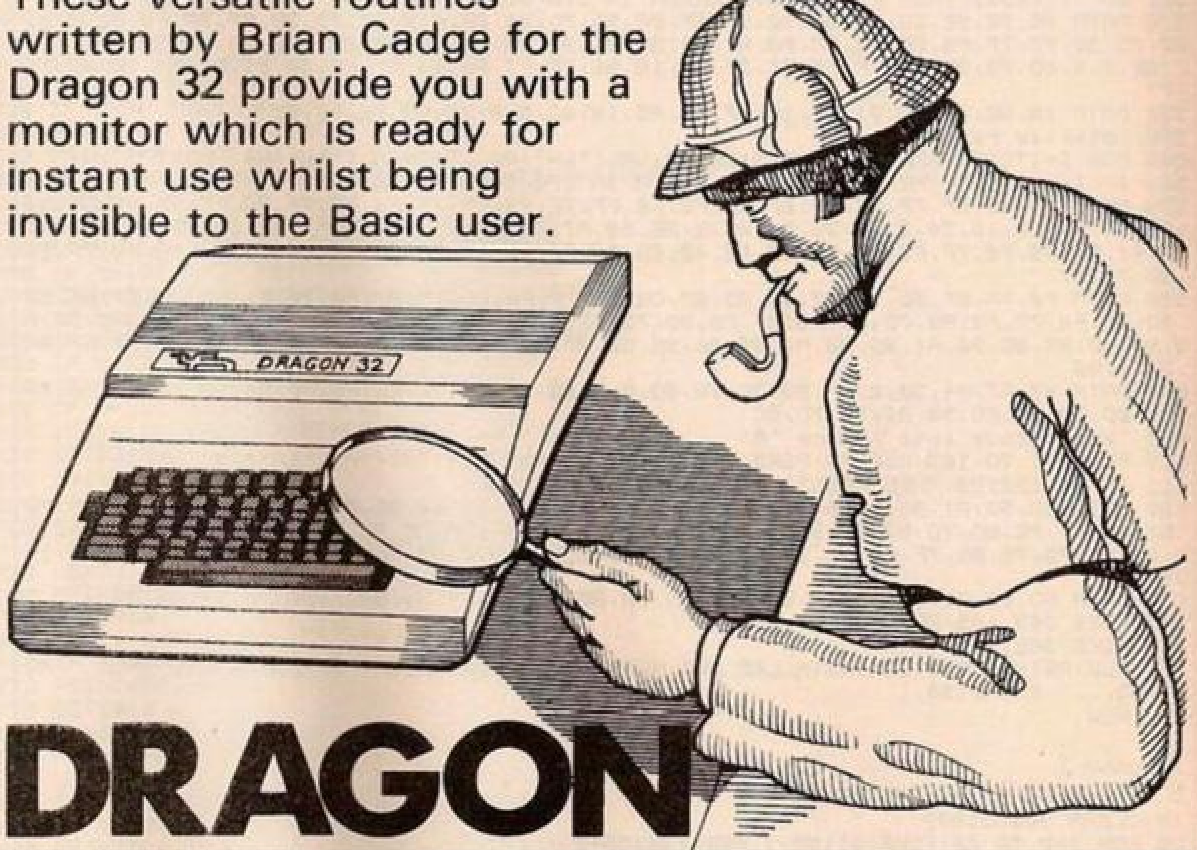
```
5 GRAPHICS 2+16
10 DIM SCR$(240),LINE$(7)
15 SCR$(1)=" ":SCR$(240)=" ":SCR$(2)=SCR$
16 REM IN 15 PUT CTRL J BETWEEN QUOTES
20 LINE$="       "
25 REM 20 IS CTRL J,,,,,J
30 START=ADR(SCR$)
31 DLIST=PEEK(560)+256*PEEK(561)+4
32 HI=INT(START/256)
33 POKE DLIST+1,HI
34 POKE DLIST,START-HI*256
40 SVE=IN
50 RAND=INT(RND(0)*2+1)
60 IN=IN+(RAND=1)-(RAND=2)
70 IF IN=-1 OR IN=14 THEN IN=SVE
75 SCR$(1,220)=SCR$(21,240)
80 SCR$(221+IN,221+IN+6)=LINE$
90 FOR N=1 TO 50:NEXT N
110 GOTO 40
```

Program 5

```
3 GRAPHICS 0:POSITION 15,12:?
  "PLEASE WAIT"
4 GOTO 10
5 FOR F=1 TO 60:B$(F,F)=CHR$
  (PEEK(53770)):NEXT F:RETURN
10 DIM MAP$(2160),B$(60)
20 FOR N=1 TO 2101 STEP 60
40 GOSUB 5:MAP$(N,N+59)=B$
70 NEXT N
90 BEGIN=ADR(MAP$)
100 GRAPHICS 2+16:ST=1536
120 FOR N=0 TO 2:POKE ST+N,112:NEXT N
130 FOR I=1 TO 12
140 POKE ST+3*I,71
150 MEMST=BEGIN+(I-1)*60
155 HI=INT(MEMST/256)
160 POKE ST+3*I+2,HI
170 POKE ST+3*I+1,MEMST-HI*256
180 NEXT I
190 POKE 1575,65
200 POKE 1576,0
210 POKE 1577,6
220 POKE 560,0
230 POKE 561,6
1000 X=0:Y=0
1005 POKE 712,10
1010 ST=STICK(0)
1020 IF ST=15 THEN 1010
1030 X=X+(ST=7 AND X<40)-
     (ST=11 AND X>0)
1040 Y=Y-(ST=14 AND Y>0)+
     (ST=13 AND Y<24)
1050 TMP=BEGIN+X+Y*60
1060 FOR N=1540 TO 1573 STEP 3
1070 HI=INT(TMP/256)
1075 POKE N+1,HI
1080 POKE N,TMP-HI*256
1090 TMP=TMP+60
1100 NEXT N
1110 GOTO 1010
```

MONITOR AND DISASSEMBLER

These versatile routines written by Brian Cadge for the Dragon 32 provide you with a monitor which is ready for instant use whilst being invisible to the Basic user.



DRAGON

THIS MACHINE-CODE monitor for the Dragon 32 computer offers nine commands directly accessible from the keyboard in Basic. Once installed, the monitor is called by pressing the right arrow key; this is achieved by interrupting the Dragon's key-scan routine to check whether the right arrow has been pressed. In this way the monitor can be ready for use at any time whilst being transparent to the Basic user.

When you call the monitor by pressing the right arrow key, you should get the monitor's command prompt. This is a left-pointing arrow and means that Monit32 is expecting a command. There are two other important prompts which you will need to know, these are: the "greater-than sign" which means Monit32 requires a 16-bit — four digit hexadecimal — address or length. All numbers input and output in hexadecimal. It is important to enter four characters, for example if the number 7F3 were to be entered you must type 07F3.

The other prompt is a "less-than sign" which means that Monit32 is expecting an eight-bit — two-digit hex — number. Here is a summary of the commands and their uses:

- **O** Sets the origin address which is used by some of the other commands.
- **A** Allows you to enter code into memory starting at the address set by O. To terminate the command enter an asterisk as the code.
- **E** Displays the contents of a page of memory in hexadecimal starting from the address set by O. Pressing Enter will increase the address by one, pressing Clear will decrease the address by one. Pressing the space-bar returns to command level.
- **F** This command is used to fill a section of memory with a constant. When pressed, Monit32 will first require a 16-bit length and then the value of the constant. That length of memory will then be filled with that constant starting at the address set by O.
- **J** This is used to jump to the 16-bit address given after J.
- **M** The M command is very useful for moving machine-code or graphics pages. When called, the monitor first requires the length of code to be moved, for example, 00FE to move 254 bytes. Then the starting address of the destination is entered. The code starting at the address set by 0 will then be copied to the memory starting at the address given for the length given.
- **R** The contents of the 6809E microprocessor registers, A, B, X, Y, S and U

(continued on next page)

Disassembled version of the monitor.

```
10 CLEAR 200,31699
15 T=0:PRINT:PRINT"PLEASE WAIT A MOMENT WHILST CODEIS INSTALLED...":SOUND190,1
20 FOR I=1 TO 59:READ A$:POKE 31999+I,VAL("&H"+A$):T=T+VAL("&H"+A$):NEXT
21 IF T<>5885 THEN PRINT"DATA ERROR IN 30":STOP
30 DATA 81,09,27,1,39,34,36,86,39,B7,01,6A,9E,88,86,5F,A7,89,0,0,30,1,9F,88,BD,A
0,EA,B7,7F,EE,8A,40,9E,88,A7,89,0,0,30,1,9F,88,B6,7F,EE,81,5A,26,08,86,7E,B7,01,
6A,35,36,39,20,3B
50 'return value in buff+X in B
60 FOR I=60 TO 118:READ A$:POKE 31999+I,VAL("&H"+A$):T=T+VAL("&H"+A$):NEXT
61 IF T<>13250 THEN PRINT"DATA ERROR IN 70":STOP
70 DATA A6,89,7F,EE,80,39,2E,0B,A6,89,7F,EE,80,30,C6,10,3D,20,08,A6,89,7F,EE,80,
37,20,F3,A6,89,7F,EF,80,39,2E,0F,A6,89,7F,EF,80,30,12,B7,7F,F2,FB,7F,F2,20,08,A6
,89,7F,EF,80,37,20,EF,39
90 'input routine for buff1-4
100 FOR I=119 TO 183:READA$:POKE 31999+I,VAL("&H"+A$):T=T+VAL("&H"+A$):NEXT
101 IF T<>19267 THEN PRINT"DATA ERROR IN 110":STOP
110 DATA 7E,7D,E9,8E,0,0,BD,A0,EA,81,08,26,11,8C,0,0,27,F4,10,9E,88,31,3F,10,9F,
88,30,1F,20,E8,81,0D,26,04,BD,90,A1,39,A7,89,7F,EE,8A,40,8C,00,04,24,0E,30,01,10
,9E,88,A7,A9,00,00,31,21,10,9F,88,20,C5
150 'hex print routine val in B
160 FOR I=184 TO 233:READ A$:POKE 31999+I,VAL("&H"+A$):T=T+VAL("&H"+A$):NEXT
161 IF T<>24421 THEN PRINT"DATA ERROR IN 170":STOP
170 DATA F7,7F,FF,54,54,54,54,C4,0F,C1,09,2E,04,CB,70,20,02,CB,37,BD,12,F6,7F,FF
,C4,0F,C1,09,2E,04,CB,70,20,02,CB,37,BD,01,39,9E,88,E7,89,00,00,30,01,9F,88,39
190 'recognise MONIT32 command
200 FOR I=234 TO 307:READ A$:POKE 31999+I,VAL("&H"+A$):T=T+VAL("&H"+A$):NEXT
201 IF T<>31181 THEN PRINT"DATA ERROR IN 210":STOP
210 DATA 81,4F,26,03,7E,7E,33,81,4A,26,03,7E,7E,57,81,53,26,03,7E,7E,8A,81,45,26
,3,7E,7E,95,81,46,26,03,7E,7F,1E,81,4D,26,03,7E,7F,66,81,52,26,03,7E,7C,3B,81,41
,26,03,7E,7B,D4,9E,88,86,7F,A7,89,0,0,30,1,9F,88,BD,90,A1,7E,7D,0C
250 'set origin module 'O'
260 FOR I=308 TO 343:READ A$:POKE 31999+I,VAL("&H"+A$):T=T+VAL("&H"+A$):NEXT
261 IF T<>35368 THEN PRINT"DATA ERROR IN 270":STOP
270 DATA 9E,88,86,7E,A7,89,0,0,30,01,9F,88,BD,7D,79,8E,0,0,BD,7D,3B,F7,7F,FD,8E,
0,2,BD,7D,3B,F7,7F,FE,7E,7D,0C
290 'Jump to address 'J'
300 FOR I=344 TO 394:READA$:POKE 31999+I,VAL("&H"+A$):T=T+VAL("&H"+A$):NEXT
301 IF T<>40535 THEN PRINT"DATA ERROR IN 310":STOP
310 DATA 9E,88,86,7E,A7,89,0,0,30,1,9F,88,BD,7D,79,8C,0,0,2E,3,7E,7D,0C,8E,0,0,B
D,7D,3B,F7,7E,88,8E,0,2,BD,7D,3B,F7,7E,89,86,7E,B7,01,6A,35,36,7E,83,71
```

(listing continued on next page)

(listing continued from previous page)

```
340 'exec subroutine from origin
350 FORI=395 TO 405:READA$:POKE 31999+I,VAL("&H"+A$):T=T+VAL("&H"+A$):NEXT
351 IF T<>42167 THEN PRINT"DATA ERROR IN 360":STOP
360 DATA BD,90,A1,BE,7F,FD,AD,84,7E,7D,0C
390 'examine memory form origin
400 FOR I=406 TO 542:READ A$:POKE 31999+I,VAL("&H"+A$):T=T+VAL("&H"+A$):NEXT
401 IF T<>59267 THEN PRINT"DATA ERROR IN 410/420":STOP
410 DATA 8E,0,0,86,60,A7,89,04,00,30,01,8C,02,00,26,F5,8E,04,00,9F,88,10,BE,7F,F
D,10,BF,7F,F6,86,0E,B7,7F,F5,F6,7F,F6,BD,7D,B7,F6,7F,F7,BD,7D,B7,86,09,9E,88,30,
01,9F,88,10,BE,7F,F6,E6,A4,31,21,10,BF,7F,F6,BD,7D,B7,4A,26,E8,BD,90,A1,B6,7F,F5
,4A
420 DATA 27,05,B7,7F,F5,20,CC,9E,88,86,6A,A7,84,30,1,9F,88,BD,A0,EA,81,0D,26,0A,
BE,7F,FD,30,01,BF,7F,FD,20,9F,81,0C,26,0A,BE,7F,FD,30,1F,BF,7F,FD,20,F0,81,20,26
,DD,BD,90,A1,7E,7D,0C
450 'fill form origin 'F'
460 FOR I=543 TO 614:READ A$:POKE 31999+I,VAL("&H"+A$):T=T+VAL("&H"+A$):NEXT
461 IF T<>67688 THEN PRINT"DATA ERROR IN 470":STOP
470 DATA 86,7E,9E,88,A7,84,30,01,9F,88,BD,7D,79,8E,0,0,BD,7D,3B,F7,7F,F5,8E,00,0
2,BD,7D,3B,F7,7F,F6,9E,88,86,7C,A7,84,30,01,9F,88,BD,7D,79,8E,0,0,BD,7D,3B,BE,7F
,FD,10,BE,7F,F5,E7,84,30,01,31,3F,10,8C,0,0,26,F4,7E,7D,0C
490 'move code  'M'
500 FOR I=615 TO 714:READA$:POKE 31999+I,VAL("&H"+A$):T=T+VAL("&H"+A$):NEXT
501 IF T<>79939 THEN PRINT"DATA ERROR IN 510/520":STOP
510 DATA 86,7E,9E,88,A7,84,30,01,9F,88,BD,7D,79,8E,0,0,BD,7D,3B,F7,7F,F5,8E,0,2,
BD,7D,3B,F7,7F,F6,86,7E,9E,88,A7,84,30,01,9F,88,BD,7D,79,8E,0,0,BD,7D,3B,F7,7F,F
7,8E,0,2,BD,7D,3B,F7,7F,F8,BE,7F,FD,10,BE,7F,F7,A6,84,A7,A4,30,01,31,21,10,BF,7F
,F7
520 DATA 10,BE,7F,F5,31,3F,10,BF,7F,F5,10,8C,0,0,26,E0,7E,7D,0C
550 'display registers 'R'
560 FOR I=1TO197:READA$:POKE 31802+I,VAL("&H"+A$):T=T+VAL("&H"+A$):NEXT
561 IF T<>108885 THEN PRINT"DATA ERROR IN 570/580/590":STOP
570 DATA 35,36,BF,7F,EE,10,BF,7F,F0,10,FF,7F,F2,FF,7F,F4,B7,7F,F6,F7,7F,F7,34,36
,BD,90,A1,20,16,34,2,BD,90,A1,35,2,9E,88,A7,84,30,01,86,7D,A7,84,30,02,9F,88,39,
86,41,8D,E6,F6,7F,F6,BD,7D,B7,86,42,8D,DC,F6,7F,F7,BD,7D,B7,86,58,8D,D2,F6,7F,EE
,BD,7D,B7
580 DATA F6,7F,EF,BD,7D,B7,86,59,8D,C2,F6,7F,F0,BD,7D,B7,F6,7F,F1,BD,7D,B7,86,53
,8D,B2,F6,7F,F2,BD,7D,B7,F6,7F,F3,BD,7D,B7,86,55,8D,A2,F6,7F,F4,BD,7D,B7,F6,7F,F
5,BD,7D,B7,BD,90,A1,BD,90,A1,9E,88,86,50,A7,84,30,1,86,52,A7,84,30,1,86,4F,A7,84
,30,1,86
590 DATA 47,A7,84,30,2,9F,88,DC,1B,83,0,2,93,19,FD,7F,EE,F6,7F,EE,BD,7D,B7,F6,7F
,EF,BD,7D,B7,BD,90,A1,7E,7D,0C
600 'enter code into memory 'A'
610 FOR I=1 TO 103:READA$:POKE 31699+I,VAL("&H"+A$):T=T+VAL("&H"+A$):NEXT
611 IF T<>122108 THEN PRINT"DATA ERROR IN 620/630"
620 DATA BD,90,A1,9E,88,86,4F,A7,84,30,01,86,7D,A7,84,30,02,9F,88,F6,7F,FD,BD,7D
,B7,F6,7F,FE,BD,7D,B7,BD,90,A1,10,BE,7F,FD,10,BF,7F,F6,9E,88,86,7C,A7,84,30,02,9
F,88,BD,7D,79,B6,7F,EE,81,2A,26,03,7E,7D,0C,BC,0,0,26,0F,9E,88,86,7F,A7,84,30,1,
9F,88
630 DATA BD,90,A1,20,D5,8E,0,0,BD,7D,3B,BE,7F,F6,E7,84,30,1,BF,7F,F6,20,C3
700 POKE 363,125:POKE 364,0
710 POKE 362,126
720 CLS:PRINT"MONIT32 INSTALLED AND READY -   PRESS RIGHT ARROW KEY TO CALL   MO
NIT32...":SOUND190,1
730 NEW
```

Program 2.

```
5 ' RE-PROGRAM RESET BUTTON
10 CLEAR 300,31099
20 FOR I=0 TO 22:POKE 31100+I,PEEK(46159+I):NEXT
30 FOR I=23 TO 48:READA$:POKE 31100+I,VAL("&H"+A$):NEXT
40 DATA 8E,0,0,C6,01,A6,89,79,AE,A7,89,04,00,30,01,5A,26,F3,8E,04,FF,9F,88,7E,83
,71
50 CLS
60 PRINT "ENTER MESSAGE TO BE PRINTED WHENRESET BUTTON IS PRESSED (NO      INVERS
E CHARACTERS...":PRINT
70 LINE INPUT A$
80 FOR I=1 TO LEN(A$)
90 POKE 31149+I,ASC(MID$(A$,I,1))OR64
100 NEXT:POKE 31127,LEN(A$)
110 POKE 114,121:POKE 115,124
120 PRINT:PRINT"MESSAGE ENTERED... PRESS RESET  TO TEST..."
130 END
```

Program 3.

```
10 ' 6809 DIS-ASSEMBLER FOR DRAGON 32 BY BRIAN CADGE
20 ' ********************************************
30 CLS:POKE 155,80:POKE 154,64:POKE 153,16:POKE 328,0: 'SET UP 80 COLUMN PRINTER
40 CLEAR 5000:DIM A$(255,2)
50 FOR I=0 TO 255:READ A$(I,0),A$(I,1),A$(I,2):NEXTI
60 PRINT"6809 DIS-ASSEMBLER FOR DRAGON 32"
70 PRINT:PRINT:PRINT:SOUND100,1:SOUND150,1:SOUND200,1
80 PS=PEEK(65314)AND1
90 INPUT "PRINTER [P] OR SCREEN [S] ";OP$:IF OP$<>"P" AND OP$<>"S" THEN 90 ELSE
IF OP$="P" THEN PR=-2 ELSE PR=0
100 IF PR=-2 AND PS=1 THEN PRINT"ATTEND TO PRINTER!!!":EXEC 41194:GOTO 80
110 INPUT "START ADDRESS , END ADDRESS";AD,EA
120 IF EA<0 OR EA>65535 OR EA<AD OR AD<0 OR AD>65535 THEN PRINT"INVALID ADDRESS
- REDO":GOTO70
130 CLS:PRINT@500:PRINT#PR,"":PRINT#PR,""
140 FOR I=AD TO EA
150 LI=I
160 SH=0
170 V=PEEK(I)
180 IF V=16 THEN SH=1:I=I+1:GOTO170
190 IF V=17 THEN SH=2:I=I+1:GOTO170
200 Z$=A$(V,SH):X$=RIGHT$(Z$,1)
210 IF X$<>"^" AND X$<>"#" AND X$<>"$" AND X$<>"%" AND X$<>"&" AND X$<>"<" AND X
$<>">" AND X$<>"/" THEN P$=Z$ ELSE P$=LEFT$(Z$,LEN(Z$)-1)
220 IF PR=0 THEN PRINTI;TAB(10);P$; ELSE PRINT#PR,I,P$;
230 IF X$="#" THEN 360
240 IF X$="%" THEN 380
```

(continued from previous page)

will be displayed, together with the length of any Basic program currently in the memory.

S This command executes a machine-code subroutine starting at the address given by O and then returns to the monitor.

Z Returns to Basic.

The program is used to load to monitor in reserved memory at the top of RAM. When run it will check for errors in the Data statements and inform you of any, in which case you should check through your listing against the one given. If there are no errors the monitor is installed and the loading program is Newed.

As previously mentioned, the program interrupts the key-scan routine to check if the arrow key has been pressed. Anybody interested in writing programs to use this — for example, a keyboard beep routine — will need to know the following.

Locations 363 and 364 contain the address to which the Dragon jumps when a key is pressed. To enable the interrupt, location 362 is Poked with 126, to disable the interrupt a value of 57 is Poked to location 362.

The second short program demonstrates how the Reset button can also be interrupted when pressed. The program asks for a message to be typed in and this message will then be printed before the OK prompt when ever the Reset key is pressed. This is achieved by changing locations 114 and 115 which point to the address to which the Dragon will jump when the Reset key is pressed.

It is important that the machine recovers correctly, so part of the Reset routine is copied from the ROM first of all in line 20, then your own machine-code program can follow this.

Finally, one very useful command that is missing from the Dragon's Basic is the Merge facility. However, this can be achieved as follows: type Cload "programone". When loaded type

? PEEK(25);PEEK(26);PEEK(27);PEEK(28)

Make a note of the four numbers displayed. Type

POKE 25, PEEK(27) : POKE 26, PEEK(28)–2

Now Cload "programtwo". Renumber it so that its first line number is higher than the last line number of the first program. Finally, Poke locations 25 and 26 with the original values. The programs should now have been merged. This works as locations 25 and 26 contain the Start address of the program and locations 27 and 28 contain the end address plus two of the program. This information can also be used to clear all of the graphics pages; usually you must have at least one page reserved. Type in

POKE 25,6 : NEW

and you will have just under 31K of free memory. Make sure that there is no program in the memory before you do this or it will create chaos.

Program 3 is a full 6809 disassembler program designed to run on the Dragon 32. Note that the program can be used with or without the printer, the only difference in output being that the hexadecimal code is also output to the printer whereas only the address and mnemonic is printed when disassembling to the screen.

All of the mnemonics are held in Data

statements at the end of the program in lines 890 onwards. Take care when entering these to insert the correct number of commas between each word as this is very important.

The symbol after each mnemonic signifies to which addressing mode, if any, the op-code refers; for example a "greater than" symbol means indexed addressing.

The main loop is from lines 140 to 350, this prints the correct mnemonic and transfers control to one of the subroutines to print any following data.

The use of Print with a channel number means that exactly the same program can be used for both the screen and printer. Line 90 sets PR to 0 for the screen, or −2 for the printer.

Line 30 sets up an 80-column printer, and although Dragon Data never mention this, this line should be included with any program that is going to use a printer.

Use Shift @ to halt the disassembly as the text scrolls up the screen at quite a pace. If you use the program to disassemble the Basic ROM it is quite easy to find some very useful subroutines that can be called from your own Basic or machine-code programs. For example, try entering the starting address as 48299 and you will get a disassembly of the ROM's print routine, which prints the character in register A.

```
31700       JSR < 37025 >BD90A1
31703           LDX < 136 >             9E88
31705           LDA  79                 864F
31707           STA [X]                 A784
31709           LEA X  1                3001
31711           LDA  125                867D
31713           STA [X]                 A784
31715           LEA X  2                3002
31717           STX < 136 >             9F88
31719           LDB < 32765 >           F67FFD
31722           JSR < 32183 >           BD7DB7
31725           LDB < 32766 >           F67FFE
31728           JSR < 32183 >           BD7DB7
31731           JSR < 37025 >           BD90A1
31735           LDY < 32765 >           108E7FFD
31739           STY < 32758 >           108F7FF6
31742           LDX < 136 >             9E88
31744           LDA  124                867C
31746           STA [X]                 A784
31748           LEA X  2                3002
31750           STX < 136 >             9F88
31752           JSR < 32121 >           BD7D79
31755           LDA < 32750 >           B67FEE
31758           CMP A  42               812A
31760           BNE + 3                 2603
31762           JMP < 32012 >           7E7D0C
31765           CMP X  0                8C0000
31768           BNE + 15                260F
31770           LDX < 136 >             9E88
31772           LDA  127                867F
31774           STA [X]                 A784
31776           LEA X  1                3001
31778           STX < 136 >             9F88
31780           JSR < 37025 >           BD90A1
31783           BRA - 43                20D5
31785           LDX  0                  8E0000
31788           JSR < 32059 >           BD7D3B
31791           LDX < 32758 >           BE7FF6
31794           STB [X]                 E784
31796           LEA X  1                3001
31798           STX < 32758 >           BF7FF6
31801           BRA - 61                20C3
31803           PULS 00110110 BIN       3536
31805           STX < 32750 >           BF7FEE
31809           STY < 32752 >           108F7FF0
31813           STS < 32754 >           10FF7FF2
31816           STU < 32756 >           FF7FF4
31819           STA < 32758 >           B77FF6
31822           STB < 32759 >           F77FF7
31825           PSHS 00110110 BIN       3436
31827           JSR < 37025 >           BD90A1
31830           BRA + 22                2016
31832           PSHS 00000010 BIN       3402
31834           JSR < 37025 >           BD90A1
31837           PULS 00000010 BIN       3502
31839           LDX < 136 >             9E88
31841           STA [X]                 A784
31843           LEA X  1                3001
31845           LDA  125                867D
31847           STA [X]                 A784
31849           LEA X  2                3002
31851           STX < 136 >             9F88
31853           RTS                     39
31854           LDA  65                 8641
31856           BSR - 26                8DE6
```

(continued on next page)

```
250 IF X$="$" THEN 400
260 IF X$="&" THEN 430
270 IF X$=">" THEN 460
280 IF X$="<" THEN 680
290 IF X$="^" THEN 750
300 IF X$="/" THEN 820
310 IF PR=0 THEN 350
320 PRINT#PR,TAB(36);:FOR JJ=LI TO I:HE$=HEX$(PEEK(JJ)):IF LEN(HE$)<2 THEN HE$="
0"+HE$
330 PRINT#PR,HE$;
340 NEXT JJ
350 PRINT#PR,"":NEXTI:END
360 I=I+1:V=PEEK(I):PRINT#PR,V;
370 GOTO 310
380 I=I+1:V=PEEK(I)*256+PEEK(I+1):I=I+1:PRINT#PR,V;
390 GOTO 310
400 I=I+1:V=PEEK(I)
410 PRINT#PR,"("V")";
420 GOTO 310
430 I=I+1:V=PEEK(I)*256+PEEK(I+1):I=I+1
440 PRINT#PR,"("V")";
450 GOTO310
460 I=I+1
470 V=PEEK(I)
480 PRINT#PR,"[";
490 V=V AND 96
500 IF V=0 THEN P$="X"
510 IF V=32 THEN P$="Y"
520 IF V=64 THEN P$="U"
530 IF V=96 THEN P$="S"
540 PRINT#PR,P$;" ";
550 IF (PEEK(I)AND128)=0 THEN PRINT#PR,"+";(PEEK(I)AND31);"]";:GOTO670
560 V=PEEK(I)AND159
570 IF V=132 THEN PRINT#PR," ";:GOTO670
580 IF V=136 THEN PRINT#PR,"+";:GOTO360
590 IF V=137 THEN PRINT#PR,"+";:GOTO380
600 IF V=134 THEN PRINT#PR,"+A]";:GOTO670
610 IF V=133 THEN PRINT#PR,"+B]";:GOTO670
620 IF V=139 THEN PRINT#PR,"+D]";:GOTO670
630 IF V=128 THEN PRINT#PR," INC 1]";
640 IF V=129 THEN PRINT#PR," INC 2]";
650 IF V=130 THEN PRINT#PR," DEC 1]";
660 IF V=131 THEN PRINT#PR," DEC 2]";
670 GOTO310
680 I=I+1:V=PEEK(I)
690 P$=""
700 FOR J=7 TO 0 STEP-1
710 IF V<INT(2^J) THEN P$=P$+"0" ELSE V=V-INT(2^J):P$=P$+"1"
720 NEXTJ
730 PRINT#PR,P$" BIN";
740 GOTO310
750 I=I+1:V=PEEK(I)
760 IF V>127 THEN 790
770 PRINT#PR,"+"V;
780 GOTO810
790 V=256-V
800 PRINT#PR,"-"V;
810 GOTO 310
820 I=I+1:V=PEEK(I)*256+PEEK(I+1):I=I+1
830 IF V>32767 THEN 860
840 PRINT#PR,"+"V;
850 GOTO880
860 V=65536-V
870 PRINT#PR,"-"V;
880 GOTO310
890 DATA NEG $,,,ERR,,,ERR,,,COM $,,,LSR $,,,ERR,,,ROR $,,,ASR $,,,ASL $,,,ROL $
,,,DEC $,,,ERR,,,INC $,,,TST $,,,JMP $,,,CLR $,,,SFT,,,SFT2,,,NOP,,,SYNC,,,ERR,,
,ERR,,,ERR,,,LBRS %,,
900 DATA ERR,,,DAA,,,OR CC #,,,ERR,,,AND CC #,,,SEX,,,EXG <,,,TFR <,,,BRA ^,LBRA
 /,,BRN ^,LBRN /,,BHI ^,LBHI /,,BLS ^,LBLS /,,BHS ^,LBHS /,,BLO ^,LBLO /,,BNE ^,
LBNE /,,BEQ ^,LBEQ /,,BVC ^,LBVC /,,BVS ^,LBVS /,,BPL ^,LBPL /,,BMI ^,LBMI /,,BG
E ^,LBGE /,
910 DATA BLT ^,LBLT /,,BGT ^,LBGT /,,BLE ^,LBLE /,,LEA X >,,,LEA Y >,,,LEA S >,,
,LEA U >,,,PSHS <,,,PULS <,,,PSHU <,,,PULU <,,,ERR,,,RTS,,,ERR,,,RTI,,,CWAI #,,,
MUL,,,ERR,,,SWI 1,SWI 2,SWI 3,NEG A,,,ERR,,,ERR,,,COM A,,
920 DATA LSR A,,,ERR,,,ROR A,,,ASR A,,,ASL A,,,ROL A,,,DEC A,,,ERR,,,INC A,,,TST
 A,,,ERR,,,CLR A,,,NEG B,,,ERR,,,ERR,,,COM B,,,LSR B,,,ERR,,,ROR B,,,ASR B,,,ASL
 B,,,ROL B,,,DEC B,,,ERR,,,INC B,,,TST B,,,ERR,,,CLR B,,,NEG >,,,ERR,,,ERR,,,COM
 >,,
930 DATA LSR >,,,ERR,,,ROR >,,,ASR >,,,ASL >,,,ROL >,,,DEC >,,,ERR,,,INC >,,,TST
 >,,,JMP >,,,CLR >,,,NEG &,,,ERR,,,ERR,,,COM &,,,LSR &,,,ERR,,,ROR &,,,ASR &,,,A
SL &,,,ROL &,,,DEC &,,,ERR,,,INC &,,,TST &,,,JMP &,,,CLR &,,,SUB A #,,,CMP A #,,
,SBC A #,,
940 DATA SUB D %,CMP D %,CMP U %,AND A #,,,BIT A #,,,LDA #,,,ERR,,,EOR A #,,,ADC
 A #,,,OR A #,,,ADD A #,,,CMP X %,CMP Y %,CMP S %,BSR ^,,,LDX %,LDY %,,ERR,,,SUB
 A $,,,CMP A $,,,SBC A $,,,SUB D $,CMP D $,CMP U $,AND A $,,,BIT A $,,,LDA $,,,S
TA $,,
950 DATA EOR A $,,,ADC A $,,,OR A $,,,ADD A $,,,CMP X $,CMP Y $,CMP S $,JSR $,,,
LDX $,LDY $,,STX $,STY $,,SUB A >,,,CMP A >,,,SBC A >,,,SUB D >,CMP D >,CMP U >,
AND A >,,,BIT A >,,,LDA >,,,STA >,,,EOR A >,,,ADC A >,,,OR A >,,,ADD A >,,
960 DATA CMP X >,CMP Y >,CMP S >,JSR >,,,LDX >,LDY >,,STX >,STY >,,SUB A &,,,CMP
 A &,,,SBC A &,,,SUB D &,CMP D &,CMP U &,AND A &,,,BIT A &,,,LDA &,,,STA &,,,EOR
 A &,,,ADC A &,,,OR A &,,,ADD A &,,,CMP X &,CMP Y &,CMP S &,JSR &,,,LDX &,LDY &,
970 DATA STX &,STY &,,SUB B #,,,CMP B #,,,SBC B #,,,ADD D %,,,AND B #,,,BIT B #,
,,LDB #,,,ERR,,,EOR B #,,,ADC B #,,,OR B #,,,ADD B #,,,LDD %,,,ERR,,,LDU %,LDS %
,,ERR,,,SUB B $,,,CMP B $,,,SBC B $,,,ADD D $,,,AND B $,,,BIT B $,,
980 DATA LDB $,,,STB $,,,EOR B $,,,ADC B $,,,OR B $,,;ADD B $,,,LDD $,,,STD $,,,
LDU $,LDS $,,STU $,STS $,,SUB B >,,,CMP B >,,,SBC B >,,,ADD D >,,,AND B >,,,BIT
B >,,,LDB >,,,STB >,,,EOR B >,,,ADC B >,,,OR B >,,,ADD >,,,LDD >,,,STD >,,,LDU >
,LDS >,
990 DATA STU >,STS >,,SUB B &,,,CMP B &,,,SBC B &,,,ADD A &,,,AND B &,,,BIT B &,
,,LDB &,,,STB &,,,EOR B &,,,ADC B &,,,OR B &,,,ADD B &,,,LDD &,,,STD &,,,LDU &,L
DS &,,STU &,STS &,
```

(listing continued from previous page)

```
31858   LDB ( 32758 )         F67FF6
31861   JSR ( 32183 )         BD7DB7
31864   LDA  66               8642
31866   BSR - 36              8DDC
31868   LDB ( 32759 )         F67FF7
31871   JSR ( 32183 )         BD7DB7
31874   LDA  88               8658
31876   BSR - 46              8DD2
31878   LDB ( 32750 )         F67FEE
31881   JSR ( 32183 )         BD7DB7
31884   LDB ( 32751 )         F67FEF
31887   JSR ( 32183 )         BD7DB7
31890   LDA  89               8659
31892   BSR - 62              8DC2
31894   LDB ( 32752 )         F67FF0
31897   JSR ( 32183 )         BD7DB7
31900   LDB ( 32753 )         F67FF1
31903   JSR ( 32183 )         BD7DB7
31906   LDA  83               8653
31908   BSR - 78              8DB2
31910   LDB ( 32754 )         F67FF2
31913   JSR ( 32183 )         BD7DB7
31916   LDB ( 32755 )         F67FF3
31919   JSR ( 32183 )         BD7DB7
31922   LDA  85               8655
31924   BSR - 94              8DA2
31926   LDB ( 32756 )         F67FF4
31929   JSR ( 32183 )         BD7DB7
31932   LDB ( 32757 )         F67FF5
31935   JSR ( 32183 )         BD7DB7
31938   JSR ( 37025 )         BD90A1
31941   JSR ( 37025 )         BD90A1
31944   LDX ( 136 )           9E88
31946   LDA  80               8650
31948   STA [x]               A784
31950   LEA X  1              3001
31952   LDA  82               8652
31954   STA [x]               A784
31956   LEA X  1              3001
31958   LDA  79               864F
31960   STA [x]               A784
31962   LEA X  1              3001
31964   LDA  71               8647
31966   STA [x]               A784
31968   LEA X  2              3002
31970   STX ( 136 )           9F88
31972   LDD ( 27 )            DC1B
31974   SUB D  2              830002
31977   SUB D ( 25 )          9319
31979   STD ( 32750 )         FD7FEE
31982   LDB ( 32750 )         F67FEE
31985   JSR ( 32183 )         BD7DB7
31988   LDB ( 32751 )         F67FEF
31991   JSR ( 32183 )         BD7DB7
31994   JSR ( 37025 )         BD90A1
31997   JMP ( 32012 )         7E7D0C
32000   CMP A  9              8109
32002   BEQ + 1               2701
32004   RTS                   39
32005   PSHS 00110110 BIN     3436
32007   LDA  57               8639
32009   STA ( 362 )           B7016A
32012   LDX ( 136 )           9E88
32014   LDA  95               865F
32016   STA [x + 0 ]          A7890000
32020   LEA X  1              3001
32022   STX ( 136 )           9F88
32024   JSR ( 41194 )         BDA0EA
32027   STA ( 32750 )         B77FEE
32030   OR A  64              8A40
32032   LDX ( 136 )           9E88
32034   STA [x + 0 ]          A7890000
32038   LEA X  1              3001
32040   STX ( 136 )           9F88
32042   LDA ( 32750 )         B67FEE
32045   CMP A  90             815A
32047   BNE + 8               2608
32049   LDA  126              867E
32051   STA ( 362 )           B7016A
32054   PULS 00110110 BIN     3536
32056   RTS                   39
32057   BRA + 59              203B
32059   LDA [x + 32750 ]      A6897FEE
32063   SUB A  57             8039
32065   BGT + 11              2E0B
32067   LDA [x + 32750 ]      A6897FEE
32071   SUB A  48             8030
32073   LDB  16               C610
32075   MUL                   3D
32076   BRA + 8               2008
32078   LDA [x + 32750 ]      A6897FEE
32082   SUB A  55             8037
32084   BRA - 13              20F3
32086   LDA [x + 32751 ]      A6897FEF
32090   SUB A  57             8039
32092   BGT + 15              2E0F
32094   LDA [x + 32751 ]      A6897FEF
32098   SUB A  48             8030
32100   NOP                   12
32101   STA ( 32754 )         B77FF2
32104   ADD B ( 32754 )       FB7FF2
32107   BRA + 8               2008
32109   LDA [x + 32751 ]      A6897FEF
32113   SUB A  55             8037
32115   BRA - 17              20EF
32117   RTS                   39
32118   JMP ( 32233 )         7E7DE9
32121   LDX  0                8E0000
32124   JSR ( 41194 )         BDA0EA
32127   CMP A  8              8108
32129   BNE + 17              2611
32131   CMP X  0              8C0000
32134   BEQ - 12              27F4
32137   LDY ( 136 )           109E88
32139   LEA Y  63             313F
32142   STY ( 136 )           109F88
32144   LEA X  31             301F
32146   BRA - 24              20E8
32148   CMP A  13             810D
32150   BNE + 4               2604
32152   JSR ( 37025 )         BD90A1
32155   RTS                   39
32156   STA [x + 32750 ]      A7897FEE
32160   OR A  64              8A40
32162   CMP X  4              8C0004
32165   BHS + 14              240E
32167   LEA X  1              3001
32170   LDY ( 136 )           109E88
32172   STA [y + 0 ]          A7A90000
32176   LEA Y  33             3121
32179   STY ( 136 )           109F88
32181   BRA - 59              20C5
32183   STB ( 32767 )         F77FFF
32186   LSR B                 54
32187   LSR B                 54
32188   LSR B                 54
32189   LSR B                 54
32190   AND B  15             C40F
32192   CMP B  9              C109
32194   BGT + 4               2E04
32196   ADD B  112            CB70
32198   BRA + 2               2002
32200   ADD B  55             CB37
32202   BSR + 18              8D12
32204   LDB ( 32767 )         F67FFF
32207   AND B  15             C40F
32209   CMP B  9              C109
32211   BGT + 4               2E04
32213   ADD B  112            CB70
32215   BRA + 2               2002
32217   ADD B  55             CB37
32219   BSR + 1               8D01
32221   RTS                   39
32222   LDX ( 136 )           9E88
32224   STB [x + 0 ]          E7890000
32228   LEA X  1              3001
32230   STX ( 136 )           9F88
32232   RTS                   39
32233   CMP A  79             814F
32235   BNE + 3               2603
32237   JMP ( 32307 )         7E7E33
32240   CMP A  74             814A
32242   BNE + 3               2603
32244   JMP ( 32343 )         7E7E57
32247   CMP A  83             8153
32249   BNE + 3               2603
32251   JMP ( 32394 )         7E7E8A
32254   CMP A  69             8145
32256   BNE + 3               2603
32258   JMP ( 32405 )         7E7E95
32261   CMP A  70             8146
32263   BNE + 3               2603
32265   JMP ( 32542 )         7E7F1E
32268   CMP A  77             814D
32270   BNE + 3               2603
32272   JMP ( 32614 )         7E7F66
32275   CMP A  82             8152
32277   BNE + 3               2603
32279   JMP ( 31803 )         7E7C3B
32282   CMP A  65             8141
32284   BNE + 3               2603
32286   JMP ( 31700 )         7E7BD4
32289   LDX ( 136 )           9E88
32291   LDA  127              867F
32293   STA [x + 0 ]          A7890000
32297   LEA X  1              3001
32299   STX ( 136 )           9F88
32301   JSR ( 37025 )         BD90A1
32304   JMP ( 32012 )         7E7D0C
32307   LDX ( 136 )           9E88
32309   LDA  126              867E
32311   STA [x + 0 ]          A7890000
32315   LEA X  1              3001
32317   STX ( 136 )           9F88
32319   JSR ( 32121 )         BD7D79
32322   LDX  0                8E0000
32325   JSR ( 32059 )         BD7D3B
32328   STB ( 32765 )         F77FFD
32331   LDX  2                8E0002
32334   JSR ( 32059 )         BD7D3B
32337   STB ( 32766 )         F77FFE
32340   JMP ( 32012 )         7E7D0C
32343   LDX ( 136 )           9E88
32345   LDA  126              867E
32347   STA [x + 0 ]          A7890000
32351   LEA X  1              3001
32353   STX ( 136 )           9F88
32355   JSR ( 32121 )         BD7D79
32358   CMP X  0              8C0000
32361   BGT + 3               2E03
32363   JMP ( 32012 )         7E7D0C
32366   LDX  0                8E0000
32369   JSR ( 32059 )         BD7D3B
32372   STB ( 32392 )         F77E88
32375   LDX  2                8E0002
32378   JSR ( 32059 )         BD7D3B
32381   STB ( 32393 )         F77E89
32384   LDA  126              867E
32386   STA ( 362 )           B7016A
32389   PULS 00110110 BIN     3536
32391   JMP ( 33649 )         7E8371
32394   JSR ( 37025 )         BD90A1
32397   LDX ( 32765 )         BE7FFD
32400   JSR [x]               AD84
32402   JMP ( 32012 )         7E7D0C
32405   LDX  0                8E0000
32408   LDA  96               8660
32410   STA [x + 1024 ]       A7890400
32414   LEA X  1              3001
32416   CMP X  512            8C0200
32419   BNE - 11              26F5
32421   LDX  1024             8E0400
32424   STX ( 136 )           9F88
32427   LDY ( 32765 )         10BE7FFD
32431   STY ( 32758 )         10BF7FF6
32434   LDA  14               860E
32436   STA ( 32757 )         B77FF5
32439   LDB ( 32758 )         F67FF6
32442   JSR ( 32183 )         BD7DB7
32445   LDB ( 32759 )         F67FF7
32448   JSR ( 32183 )         BD7DB7
32451   LDA  9                8609
32453   LDX ( 136 )           9E88
32455   LEA X  1              3001
32457   STX ( 136 )           9F88
32460   LDY ( 32758 )         10BE7FF6
32463   LDB [y]               E6A4
32465   LEA Y  33             3121
32468   STY ( 32758 )         10BF7FF6
32471   JSR ( 32183 )         BD7DB7
32474   DEC A                 4A
32475   BNE - 24              26E8
32477   JSR ( 37025 )         BD90A1
32480   LDA ( 32757 )         B67FF5
32483   DEC A                 4A
32484   BEQ + 5               2705
32486   STA ( 32757 )         B77FF5
32489   BRA - 52              20CC
32491   LDX ( 136 )           9E88
32493   LDA  106              866A
32495   STA [x]               A784
32497   LEA X  1              3001
32499   STX ( 136 )           9F88
32501   JSR ( 41194 )         BDA0EA
32504   CMP A  13             810D
32506   BNE + 10              260A
32508   LDX ( 32765 )         BE7FFD
32511   LEA X  1              3001
32513   STX ( 32765 )         BF7FFD
32516   BRA - 97              209F
32518   CMP A  12             810C
32520   BNE + 10              260A
32522   LDX ( 32765 )         BE7FFD
32525   LEA X  31             301F
32527   STX ( 32765 )         BF7FFD
32530   BRA - 16              20F0
32532   CMP A  32             8120
32534   BNE - 35              26DD
32536   JSR ( 37025 )         BD90A1
32539   JMP ( 32012 )         7E7D0C
32542   LDA  126              867E
32544   LDX ( 136 )           9E88
32546   STA [x]               A784
32548   LEA X  1              3001
32550   STX ( 136 )           9F88
32552   JSR ( 32121 )         BD7D79
32555   LDX  0                8E0000
32558   JSR ( 32059 )         BD7D3B
32561   STB ( 32757 )         F77FF5
32564   LDX  2                8E0002
32567   JSR ( 32059 )         BD7D3B
32570   STB ( 32758 )         F77FF6
32573   LDX ( 136 )           9E88
32575   LDA  124              867C
32577   STA [x]               A784
32579   LEA X  1              3001
32581   STX ( 136 )           9F88
32583   JSR ( 32121 )         BD7D79
32586   LDX  0                8E0000
32589   JSR ( 32059 )         BD7D3B
32592   LDX ( 32765 )         BE7FFD
32596   LDY ( 32757 )         10BE7FF5
32599   STB [x]               E784
32601   LEA X  1              3001
32603   LEA Y  63             313F
32606   CMP Y  0              108C0000
32609   BNE - 12              26F4
32611   JMP ( 32012 )         7E7D0C
32614   LDA  126              867E
32616   LDX ( 136 )           9E88
32618   STA [x]               A784
32620   LEA X  1              3001
32622   STX ( 136 )           9F88
32624   JSR ( 32121 )         BD7D79
32627   LDX  0                8E0000
32630   JSR ( 32059 )         BD7D3B
32633   STB ( 32757 )         F77FF5
32636   LDX  2                8E0002
32639   JSR ( 32059 )         BD7D3B
32642   STB ( 32758 )         F77FF6
32645   LDA  126              867E
32647   LDX ( 136 )           9E88
32649   STA [x]               A784
32651   LEA X  1              3001
32653   STX ( 136 )           9F88
32655   JSR ( 32121 )         BD7D79
32658   LDX  0                8E0000
32661   JSR ( 32059 )         BD7D3B
32664   STB ( 32759 )         F77FF7
32667   LDX  2                8E0002
32670   JSR ( 32059 )         BD7D3B
32673   STB ( 32760 )         F77FF8
32676   LDX ( 32765 )         BE7FFD
32680   LDY ( 32759 )         10BE7FF7
32683   LDA [x]               A684
32685   STA [y]               A7A4
32687   LEA X  1              3001
32689   LEA Y  33             3121
32692   STY ( 32759 )         10BF7FF7
32696   LDY ( 32757 )         10BE7FF5
32699   LEA Y  63             313F
32702   STY ( 32757 )         10BF7FF5
32706   CMP Y  0              108C0000
32709   BNE - 32              26E0
32711   JMP ( 32012 )         7E7D0C
```

Push your Sinclair to the limit

ZX81/SPECTRUM ARCADE GAMES

NEW **ZX INVASION FORCE** (ZX81)
Use your skill to fire through the energy band to destroy the menacing alien ship — **£3.95**

NEW **SPEC INVADERS**
SPEC GOBBLEMAN
These exciting high-speed classic games incorporate hi-resolutiongraphics and sound to bring you the best in arcade action at only **£4.95** each (16/48K)

NEW **SPEC FROG 5/SHOWDOWN** (16/48K)
Hop across the dangerous road avoiding the lethal cars, then lorries. Go back to the wild west for a gunfight battle amongst cacti and wagons. Features include western music. **£4.95**

NEW **NAMTIR RAIDERS** (ZX81)
High speed, quick action arcade game with four separate groups of attackers. **£3.95**

Gobbleman also available for ZX81 at **£3.95**

UTILITIES

NEW **TOOLKIT**
Nine powerful new functions for your ZX81 (including re-number lines (goto, gosub), program merge, string finding and replacement. **£5.95**

SPEC BUG
A 30 in 1 machine code tool and disassembler for your ZX Spectrum. **£6.95**

ZX BUG
A 30 in 1 machine code tool and disassembler for your ZX81. **£6.95**

Improve your machine code programs with this new 48K Spectrum Assembler

Just released by Artic, this new professional quality assembler is also available for 16K ZX81 and features:—
* Word-processor-like text editor. * High-speed, versatile two-pass mnemonic assembler with labels and detailed error-trapping. Will assemble to any address. * Essential support facilities such as memory-edit, register inspect/modify and search for de-bugging. * Full output to ZX-printer. * Memory-status report and comprehensive user-manual. **ONLY £9.95**

ZX81 & SPECTRUM

NEW LOW PRICE ADVENTURE GAMES

ONLY £5.95 for ZX81 and £6.95 for SPECTRUM

INCA CURSE (Adventure B)
In a jungle clearing you come across an ancient Inca temple. Your mission to enter, collect the treasure and escape alive. But beware! Includes a cassette save routine.

SHIP OF DOOM (Adventure C)
You are unavoidably drawn to an alien cruiser. Can you reach the control room and free yourself? Or will they get you first? Includes a cassette save routine.

ESPIONAGE ISLAND (Adventure D)
While on a reconnaisance mission your plane loses control and you are forced to land. Can you survive and escape with the island's hidden secret?

PLANET OF DEATH (Adventure A) 16/48K
You find yourself stranded on an inhabited alien planet. Can you reach your ship and escape?

also available for SPECTRUM

ZX FORTH

Supplied on cassette with editor cassette, user manuals and keyboard overlay. ZX Forth combines the simplicity of basic with the speed of machine code now **£14.95**

THE ULTIMATE ADVENTURE FOR THE SPECTRUM/ZX81 for only £9.95

AND THE CHANCE TO WIN £10,000 or more IF YOU KRAKIT™

RULES AVAILABLE FROM ARTIC

Your eccentric father has left you £10,000 in his will. In order to claim your windfall you must solve twelve clues and gain access to a bank account in which the money has actually been deposited. Be the first to crack the puzzle and the prize is yours! Plus you will win two tickets to the city of the secret KRAKIT™vault location. The Prize money is increased weekly. A telephone number will be supplied so you have the opportunity to find out just how much you could win.

DON'T MISS YOUR CHANCE TO WIN A FORTUNE!

SPECTRUM MICRO CHESS

The only Chess program for a 16K or 48K Spectrum. Allows all legal moves, castelling; en-passant and pawn promotion. Options to play black/or white. Sets board in any position. Full colour and graphics display.
ONLY **£6.95**

new releases for 16K & 48K SPECTRUM

SPECTRUM INVASION FORCE

A popular arcade game for 16K or 48K Spectrum. Fires through the force field to destroy the menacing alien ship. Sounds easy?? Two levels of play — normal or suicidal. Full colour. Sound and hi-res. graphics.
NOW ONLY **£4.95**

A GREAT CHESS GAME FOR YOUR ZX81 OR SPECTRUM*



*SPECTRUM CHESS 48K

ZX CHESS I
Very popular machine code program, with six levels of play and an analysis option. Available for ZX81. **£6.50**

ZX CHESS II
A new improved version, with a faster response time, seven levels of play, analysis option and in addition a recommended move option. **£9.95**

ZX 1K CHESS
An incredible game in 1K for only **£2.95** As featured on ITV

NEW **SPECTRUM VOICE CHESS**
This incredible program talks you through your game. It tells you its move, recommends a move, and contains a range of facetious comments. The game is based on the highly successful ZX Chess II and is offered at the Christmas offer price of **£9.95**.

SPECTRUM CHESS now only **£9.45**

ALWAYS AHEAD WITH ZX81/SPECTRUM SOFTWARE

Cheques & P.O. made payable to: Artic Computing Limited. Dealer enquiries welcome.
Please state whether your order is for ZX81 or Spectrum. Send S.A.E. (6in × 9in) for catalogue.

ARTIC COMPUTING LTD.
396 JAMES RECKITT AVENUE, HULL, N. HUMBERSIDE,

To: Artic Computing Ltd., 396 James Reckitt Avenue, Hull, N. Humberside, HU8 0JA.

Please supply..............................

....

....

Cheque for total amount enclosed.

Name..............................

Address..............................

....

YC5



THE SILVERSOFT COLLECTION

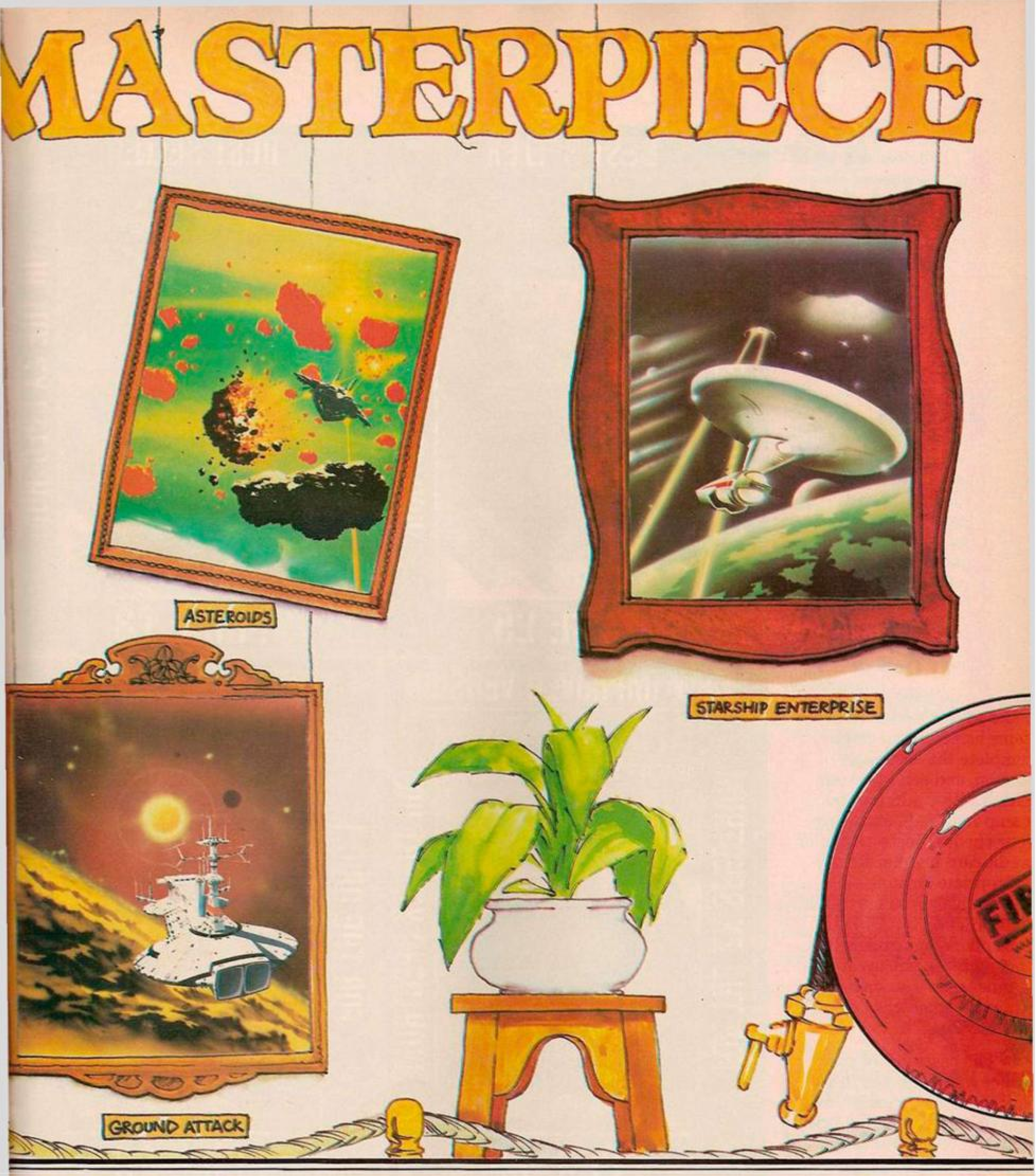
Silversoft, Masters of the video canvas present the first of a timeless collection of Electrik Artwork for the connoisseur. Our skilled artists have toiled over their electronic easels to produce these moving masterpieces - now being exhibited throughout the galaxy. Complete details of these classic programs may be found in our fully illustrated catalogue.* Your local software gallery can arrange a viewing - so beam down there and pick up an original. Don't forget Silversoft still deliver direct to anywhere in the known universe (Post Office willing). If your local (art) dealer is out of stock then please contact us straight away.

* A must for serious collectors.

ALSO AVAILABLE FROM BRANCHES OF W.H.SMITH, BOOTS, JOHN MENZIES & ALL GOOD COMPUTER STORES.

Send to: **SILVERSOFT Ltd**
LONDON HOUSE
271-273 KING ST
LONDON W6
TEL: 01-748 4125

Please note: Due to expansion we have moved to larger premises, we apologise in advance for any inconvenience to our customers.



ZX SPECTRUM SOFTWARE				ZX81 SOFTWARE (16K ONLY)		
ORBITER	£5.95		☐	INVADERS	£3.95	☐
GROUND ATTACK	£5.95		☐	ASTEROIDS	£3.95	☐
CYBER RATS NEW	£5.95		☐	ALIEN DROPOUT	£3.95	☐
SLIPPERY SID NEW	£5.95		☐	MUNCHER (ZX81)	£4.95	☐
STARSHIP ENTERPRISE	£5.95	48K ONLY	☐	STARTREK	£3.95	☐
MUNCHER	£5.95		☐	ZX COMPILER	£5.95	☐

Response Coupon

Tick box(es) as required

I enclose a cheque/PO for ....

Name..

Address ....

....

....

I require a free catalogue ☐

All the best sellers..

For all home micro-users who don't live near one of the larger city branches of Boots or W. H. Smith, and who find difficulty in purchasing the very latest, best-selling software – here is the answer!

Software Express is the new, mail-order arm of a £12 million group of companies. We have just signed an agreement with Bug-Byte, Britain's most successful software house, to supply their exciting products direct to you, the user. New and original games for the ZX81, Spectrum, BBC Micro, VIC 20 and Oric 1 can be delivered to your door AT SHOP PRICES. That's right, positively no extra charges – we even pay the postage both ways!

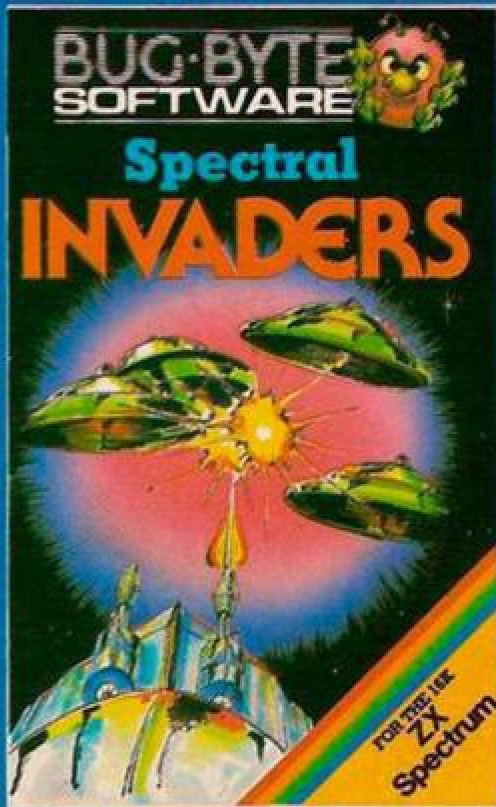
All you have to do is make your selection from the items listed on this page, complete the easy reply coupon, and send it to our FREEPOST address (no stamp required), enclosing your cheque, postal order, or credit card number for the appropriate amount. Alternatively, you may place your order on our 24 hour Ansaphone by phoning in your Access/Barclaycard number with your name, address and details of your order.

The cassettes of your choice will be mailed to you quickly and efficiently. No cheques will be cashed prior to despatch of your order, and if for any reason you are not satisfied with your purchase, we will give you a full refund just as quickly.

It's so simple! The best quality software, promptly and conveniently at no extra cost from Software Express. Try us and see for yourself – we go out of our way especially for you.

BEST SELLER

FOR THE ZX SPECTRUM

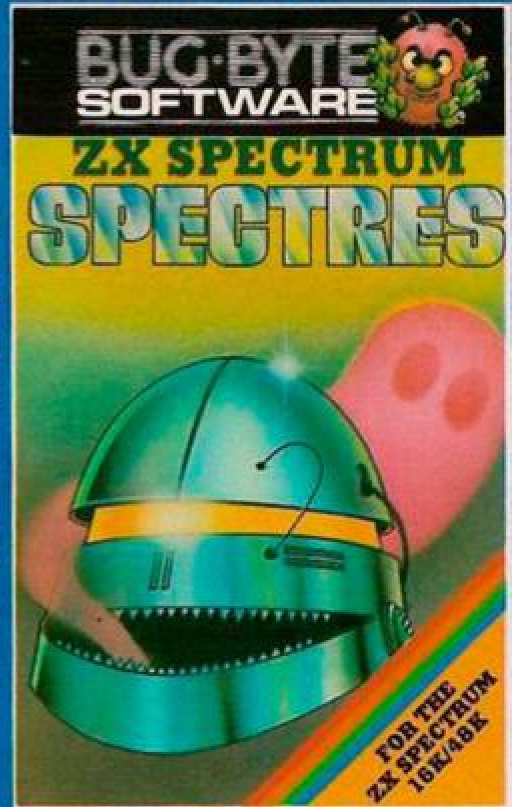


FOR THE ZX SPECTRUM

PRICE £5

BEST SELLER

FOR THE ZX SPECTRUM

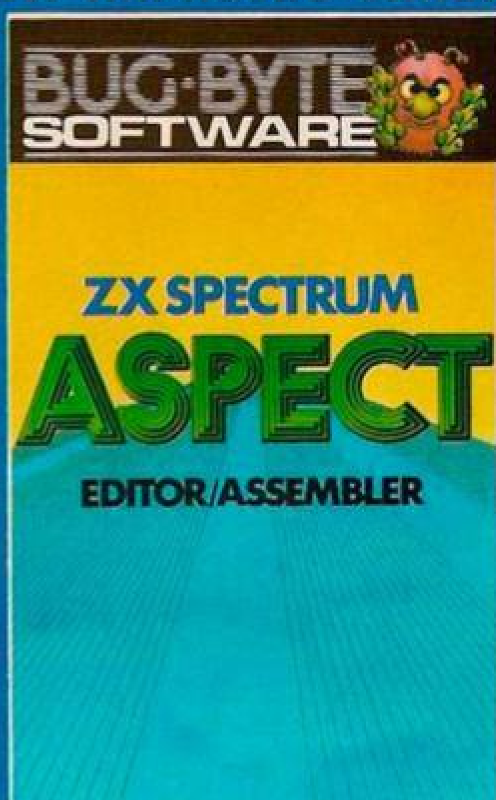


FOR THE ZX SPECTRUM

PRICE £8

NEW IMPROVED VERSION

FOR THE ZX SPECTRUM

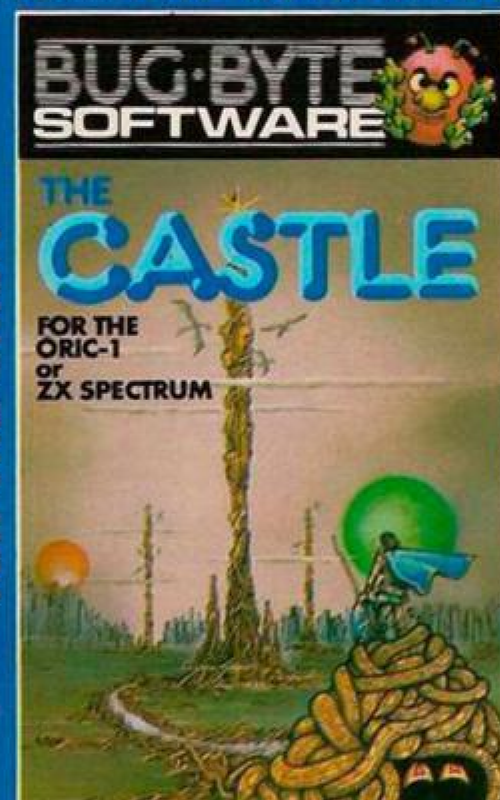


FOR THE ZX SPECTRUM

PRICE £9

★NOW ON SPECTRUM★

FOR THE ORIC 1



FOR THE ZX SPECTRUM

PRICE £8

OTHER TITLES AVAILABLE FROM SOFTWARE EXPRESS..

FOR THE VIC 20 . . .

VIC Chess – £7. VIC Asteroids – £7. VIC Panic – £7. VIC Cosmiads – £7. Another VIC in the Wall – £7. VIC Backgammon – £7. VIC Scramble – £7. All programs are for the unexpanded VIC 20, with the exception of Chess (16K) and Backgammon (min. 3K expansion).

FOR THE ZX81 . . .

Mazogs – £10. Dictator – £9. Invaders – £4. ZXAS (Z80 Assembler) – £5. ZXDB (Z80 Debugger) – £6.50. ZXTK (Z80 Toolkit) – £6. (all programs are for the 16K – ZX81).

All dealer enquiries to: Bug-Byte Software, 100 The Albany, Old Hall Street, Liverpool L3 9EP.

Although the NewBrain is conceived as a total system, the unexpanded Processor itself has a great deal to offer. It is available in two forms: Model AD, shown below, with a built-in line display; and Model A, without the line display. Both models can operate with a monitor or a television set.

MEMORY

- 24K bytes of ROM;
- 32 bytes of RAM, at least 28K of which is available to the user.

THE SCREEN DISPLAY

- 40 or 80 characters to the line – without affecting the 28K bytes of RAM at your disposal;
- 24 or 30 lines to the screen;
- well-formed characters, with true descenders;
- a full European character set;
- normal or reverse video, high resolution graphics on screen of controllable size, 256, 320, 512 or 640 horizontal resolution by 250 vertical lines;
- a facility to set up a "page" of up to 255 lines, with the screen acting as a "window" to display it;
- ability to maintain several such pages simultaneously, and to switch rapidly between them;
- text may be used on graphics screen as well as on parts of the video screen not used by graphics.

CHARACTER SET

- 512 characters, including the full ASCII set, all European accented characters, Greek and graphics symbols.

GRAPHICS

- 20 powerful graphics commands;
- all text characters usable on the graphics screen;
- variable-sized graphics screen, with the rest of the screen available for text – for versatility and to save memory.

SOFTWARE

Enhanced ANSI BASIC; screen editor (32 commands); mathematics package (10 significant figures); graphics commands.

- a very friendly screen editor – a delight to use and readily adapted to text processing;
- arithmetic to 10 significant figures;
- very controllable output formatting of numbers – invaluable for accounting, statistics, and scientific applications;
- a powerful, much enhanced BASIC;
- a very flexible operating system, which allows any data stream to be opened to any device.

INTERFACES

- two tape cassette ports built into the processor unit;
- a built-in printer interface;
- a built-in communications interface (V24/RS232);
- a video monitor interface;
- a TV interface;
- an expansion interface for NewBrain system expansion modules.

KEYBOARD

- standard typewriter pitch, action, layout and size, with editing control and graphics keys.



*CP/M IS A REGISTERED TRADE MARK OF DIGITAL RESEARCH INC.

You can get everything in the box on the

If you understand the facts and figures on the left you'll soon realise that NewBrain has to be one of the most powerful micros around.

However, if you find the box on the left a little hard to follow, don't worry.

We've got over 120 dealers nationwide who've got all the answers at their fingertips.

Either way you'll discover that NewBrain is the kind of micro that will stop the competition getting a look in.

At £269 it starts off with twice as much memory as most of its competitors and can expand to over thirty times that amount. So there's no chance of being left behind in the micro race.

It comes with a very powerful language (enhanced ANSI BASIC) and it'll take CP/M,* so it'll work on the same system as similar big business micros, giving you the capacity to use an almost limitless variety of tried and tested software.

But most of all NewBrain is a machine that can expand.

It's designed to take disks, printers and memory expansion modules (up to 2M bytes) plus anything else you'd expect a professional business micro to handle.

So, whether you understand the box on the left or not, pay a visit to someone in the know on the right.

They'll answer all your questions and give you a full demonstration.

NewBrain

Grundy Business Systems Ltd., Grundy House, Somerset Road, Teddington.

DEALER NETWORK

ALTRINCHAM
PHARMACY COMPUTER SYSTEMS (061-928 0087)

BARNSTAPLE
LANDKEY-NEWLAND (0271 77883)
J & A CAMERAS (0271 75037)

BEDFORD
MICROPOWER BUSINESS APPLICS (0234 213571)

BIRMINGHAM
CALISTO COMPUTERS LTD (021 632 6458)
LASKYS (BIRMINGHAM) (021 632 6303)
MICRO-C (BIRMINGHAM) (021-233 1105)
TYPEWRITER CENTRES (021 622 5385)

BISHOPS STORTFORD
GEM SYSTEMS LTD (0279-52401)

BOURNE
MICRO-C (LINCOLNSHIRE) (077 82 4566)

BRIGHTON
LASKYS (BRIGHTON) (0273 725625)

BRISTOL
ELECTROPRINT COMPUTERS (0272 292375)
LASKYS (BRISTOL) (0272 20421)
MICRO-C (BRISTOL) (0272 650501)
COLSTON COMPUTER CENTRE LTD (0272-276619)

BROMLEY
LASKEYS (BROMLEY) (01-464 7829)

BUCKNELL
BORDER COMPUTING & PROGRAMMING (05474 368)

CAMBERLEY
ASYST SYSTEMS CONSULTANTS LTD (0276 28397)

CAMBRIDGE
CAMBRIDGE COMPUTER STORE (0223 65334)
G C C (CAMBRIDGE) LTD (0223 835330)

CANTERBURY
M D WRIGHT DATA SERVICES LTD (0227 69090)

CANVEY ISLAND
MERCURY MICROSYSTEMS LTD (0268-696263)

CHALFONT ST GILES
PRINTIVITY LTD (02407 4906)

CHATHAM
MEDWAY COMPUTERS (0634 826080)

CHELTENHAM
COMPUTER SHACK LTD (0242 584343)

CHESTER
LASKYS (CHESTER) (0244 317667)

COLCHESTER
CAPRICORN COMPUTER CENTRE (0206 331168)

CORK
C D S COMPUTING LTD (0002 23922)

COVENTRY
COVENTRY MICROCENTRE (0203 58942)

DARLINGTON
DARLINGTON COMPUTER SHOP (0325-487478)

DERBY
DONINGTON COMPUTERS (0332 49672)

DUBLIN
THE E C L GROUP OF COS (0001 603497)

DUNFERMLINE
ANDREW THOMSON (0383 724541)

EDGWARE
CITADEL PRODUCTS LTD (01-951 1848)

EDINBURGH
JOHN MENZIES PLC (031-225 8555)
LASKYS (EDINBURGH) (031-556 2914)

ELSTREE
ELSTREE COMPUTER CENTRE (01-953 6921)

GILLINGHAM
MEDWAY MICRO COMPUTERS LTD (0634 576764)

GLASGOW
VICTOR MORRIS (AUDIO VISUAL) (041-221 8958)
LASKYS (GLASGOW) (041 226 3349)

GLOUCESTER
MILEQUIP COMPUTERS (0452 411010)

GUILDFORD
M C D LTD (0483-574659)

HAMILTON
STRATHCLYDE MICRO CENTRE (03552 22517)

HARPENDEN
CONSULTANTS IN OFFICE POWER (05827 66911)

HASTINGS
THE COMPUTER CENTRE (BMS) LTD (0424-439190)

HEREFORD
HONEYSETT COMPUTERS LTD (0432 279404)

HERTFORD
RMR COMPUTER SERVICES (0992 56160)

ISLE OF WIGHT
VECTIS COMPUTER SERVICES (0983 528345)

KIDDERMINSTER
MICRO-MART (0562-742142)

KINGSTON
LASKYS (KINGSTON) (01-546 1271)

LEEDS
MICRO-C (LEEDS) (0532 446601)
MICROCELL COMPUTER SYSTEMS (0532 661366)

LEICESTER
TILLEY COMPUTER SYSTEMS (0533-553984)
MICRO-C (LEICESTER) (0533 546224)

LIVERPOOL
LASKYS (LIVERPOOL) (051 236 2828)

LONDON
BEAUCHAMP COMPUTER SYSTEMS LTD (01-584 8203)
LION MICRO COMPUTERS (01-580 7383)
MICRO-C (LONDON NW1) (01-387 9275)
TRANSAM MICROSYSTEMS LTD (01-405 5240)
LASKYS (QUEENSWAY) (01-229 6425)
LASKYS (TOTTENHAM COURT ROAD) (01-636 0845)
LASKYS (OXFORD STREET) (01-493 4623)
OFFICE INSTALLATIONS LTD (01-579 6771)
TREND VIDEO & HI-FI LTD (01-521 6146)
WELBECK VIDEO (01-486 3783)

LOUGHBOROUGH
DATA ONE SYSTEMS LTD (0509 37281)
MICRO-C (LOUGHBOROUGH) (0509 37367)

LUTON
LASKYS (LUTON) (0582 38302)
MICRO-C (LUTON) (0582 425079)

MAIDENHEAD
KUMA COMPUTERS LTD (0628 71778/9)

MAIDSTONE
LASKYS (MAIDSTONE) (0622 678165)

MANCHESTER
N S C COMPUTER SHOPS LTD (061-832 2269)
MICRO-C (MANCHESTER) (061-834 0144)
LASKYS (MANCHESTER) (061-832 6087)
LOMAX LTD (061-832 6167)

MIDDLESBROUGH
MICRO-TECHNIC COMPUTER SYSTEMS (0642 221501/2)

MILTON KEYNES
MILTON KEYNES COMPUTER CENTRE (0908-668811)

NAILSEA
BYTE MICRO COMPUTING CENTRE (0272 851337)

NEW MILTON
SNIPE COMPUTERS LIMITED (0425 617477)

NEWCASTLE-UPON-TYNE
MICROCORE COMPUTERS (0632 846878)

NEWMARKET
DATA BASE (0638-667311)

NOTTINGHAM
MICRO-C (NOTTINGHAM) (0602 412455)
LASKYS (NOTTINGHAM) (0602 415150)

PETERBOROUGH
LASKYS (PETERBOROUGH) (0733 313513)

PLYMOUTH
DISKWISE LTD (0752 267000)

PORTHCAWL
TCPL (065-671 6114)

POTTERS BAR
SOFTWARE AGENTS LIMITED (0707-59669)

PRESCOT
MICROSYS LTD (051 426 7271)

PRESTON
LASKYS (PRESTON) (0772 59264)

READING
LASKYS (READING) (0734 595459)

RICHMOND
TANTUS MICROSYSTEMS LTD (01-940 7299)

RUGBY
OEM COMPUTER SYSTEMS (0788 70522-4)

SANDERSTEAD
J R INSTRUMENTS (01-657 7646)

SARISBURY GREEN
WENDMORE MANAGEMENT SERV LTD (04895 6318/9/0)

SHEFFIELD
T A EDUCATION LTD (0742-618539)
LASKYS (SHEFFIELD) (0742 750971)

SOUTHAMPTON
MICRO-C (SOUTHAMPTON) (0703-29676)
GODWIN ELECTRICAL LTD (0703 783322)

ST HELIER
THE PROCESSOR CENTRE (JERSEY) (0534 77070)
DATASTREAM (JERSEY) LTD (0534-71219)

ST PETER PORT
THE PROCESSOR CENTRE (GUERNSEY) (0481-28827)

STROUD
THE MODEL SHOP (045 36 5920)

SURBITON
COMPUTASOLVE (01-390 2779)

TEDDINGTON
AM PROGRAMMERS LTD (01-943 2266)
STAG TERMINALS LTD (01-943 0777)

TEIGNMOUTH
QUESTEL COMPUTERS (062-672258)

THORNTON HEATH
CROYDON COMPUTER CENTRE (01-689 1280)

UXBRIDGE
J. B MICRO (0895 57908)

WALTON ON THAMES
PMFS (98-22895)
KEY COMPUTER CENTRES LTD (09322-42777/8)

WAREHAM
GAMES & COMPUTERS (09295 51383)

WARRINGTON
NORTHERN COMPUTERS LTD (0928 35110)

WATFORD
LASKYS (WATFORD) (0923 47488)

WELWYN
ANGELA ENTERPRISES (0438 812439)

WENDOVER
TARACE LTD (0296 623965)

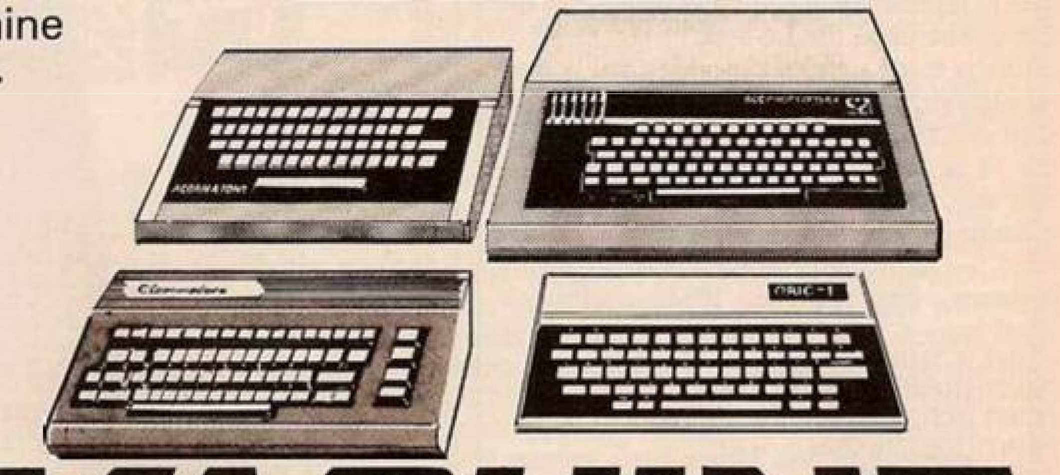
WINDSOR
CASTLE COMPUTERS (95-58118)

YORK
LASKYS (YORK) (0904 641221)

left from anyone in the box on the right.

6502 MACHINE CODE MADE EASY

Darryl Mattocks continues his guide to 6502 machine code.



IF YOU ENTERED the programs last month, then you may have been perturbed by the speed of them: how can we slow them down?

The most common method is using a delay subroutine like the one in figure 1.

This is a delay loop. It works by introducing a delay of around 0.5 seconds each time it is called. Unfortunately, it resets the X and Y registers to 0, which in a program where X and Y are used extensively is not a good idea. To get around this we grab two free memory bytes and use them as variables. This makes the program a bit harder to understand, but now X and Y are not changed within the subroutine.

Any two free memory bytes will do. I used $FE and $FF — 254 and 255 — in the example in figure 2 as they are not used on the Vic-20, but any two will do.

We still have the same overall effect, but X and Y remain unchanged. Unfortunately we had to use the accumulator, but this is excusable as 90 percent of all machine-code subroutines use it and so it is unwise to store anything of importance in there for too long a time. So we have a delay loop. Let us add it to our sound program of last month. See figure 3.

Line 100 in last month's loader would now read:

```
100 DATA A9,00,8D,0E,90, A2,FF,A0,00,CA,
    8E,0A,90,8C,0B,90,20,42,1A
102 DATA C8,D0,F3,60,A9,00,85,FE,85,FF,E6,
    FF,D0,FC,E6,FE,D0,F6,60
```

An important point to note is that the branch instruction in the sound section has changed from last month so as to obtain a better effect. As we have added a JSR instruction into our loop, we have added three extra bytes of code, so the branch has altered correspondingly. To run it, type in SYS 6700 and you will experience some weird effects.

This is what we call reading the memory and not remembering the post-code. So far three types of command have been used: first, commands which do not have an operand, for example INY and DEX. Second, branch instructions which precede a displacement rather than an actual memory address. Third, Jump commands — JSR — which precede a memory location. Fourth, commands which access the contents of a specified address.

This is just the tip of the iceberg; there are seven different ways of addressing memory: immediate, absolute, zero page, relative, indirect, indirect pre-indexed with X, and implied-implied addressing.

In immediate addressing the actual value of the operand is manipulated. The immediate addressing is expressed by putting a hash sign in front of the operand. Thus,

LDA # 5

means load the accumulator with 5, or in Basic A=5. With absolute addressing we Load from, Add to or Store into an address which is stored in two bytes immediately after the op-code. So

LDA 2048

means load the accumulator with the value stored in byte 2048, or, in Basic, A=Peek (2048).

Zero-page is absolute addressing except that all the locations are in zero-page — bytes 0 to 255 — inclusive. As one byte can hold values of 0 to 255, the zero-page addressing requires two bytes, op-code and address. In this case,

LDA 38

means load the accumulator with the value stored in byte 0038. The Basic equivalent is simply

A=PEEK(3*16+8)

Relative addressing is the type of addressing used in branch statements, that is, a displacement which is added to or subtracted from the program counter.

BEQ 3A

means if the zero flag is set — Z=1 — in the status register then skip 3A bytes of memory. There is no direct equivalent to this in Basic, but if we imagined that * symbolished the current line of code being executed, then

```
10 REM
20 X=X-1
30 IF X=0 THEN *=*-10:REM GOTO 20
```

With the indirect post-indexed with Y addressing technique, the contents of the byte specified in the operand and the following byte are converted into an address. The contents of Y are then added to this address and it is then this address that is manipulated. The indirect with Y is symbolised by brackets around the Operand and then a",Y" outside the bracket to indicate that it is post- and not pre-indexed; for example:

LDA (32),Y

If Y is equal to 12 decimal, byte 32 is equal to 41 decimal and byte 33 is equal to 22 decimal.

Then the accumulator would be loaded with the contents of byte 5685 — where

5685=12+41+22*256

In Basic this would appear as

A=PEEK (PEEK(32)+256*PEEK(33)+Y)

Indirect — pre-indexed with X addressing is similar to the previous case except now we add the contents of the X register to the operand and then take this new operand as the address of the first byte of the final address acquired. The symbolism for this type of addressing is again the brackets around the Operand but now we put a X inside the brackets:

LDA (32,X)

If X=4, byte 36=201 and byte 37=21 then the accumulator would be loaded with the contents of byte 5577, where

5577=201+21*256

In Basic this would look something like

A=PEEK(PEEK(32+x)+256*PEEK(32+x))

Implied-implied addressing requires no operand and often has very little to do with the memory at all. The op-codes in this category are mainly for changing the data in the registers. Thus INY means increment the Y register:

Y=Y+1

If one byte can contain 256 different values, then how can a computer access a memory of 65,536 — 64K — bytes? The answer is to use two bytes to represent each address.

So using two bytes for every address, we can have a total of 256 multiplied by 256 — 64K — different addresses. It is no coincidence, then, that if you add up the total amount of RAM memory and ROM memory you get 64K. Some computers such as the CBM-64 use what is known as a virtual memory system whereby the computer splits the memory up into lots of 16K blocks and then pretends to only have 16K at a time.

(continued on next page)

(continued from previous page)

An address is made up of two bytes: Hi-byte — or page number, where one page is 256 bytes and 256 pages is 64K — and another byte to represent one particular byte out of the 256 in one page, the Lo-byte.

Life is made simpler if hexadecimal is used throughout, as by definition in a hex number such as 1234. The page number is 12 leaving the 34 as the Lo-byte or byte number. The best way to convert a decimal number into a machine-code address — if the computer is at hand — is to go through the following sequence. For example, 10845 decimal is equal to.

```
PRINT INT(10845/4096) = 2       = 2
PRINT (10845-2*4096)  = 2653
PRINT INT(2653/256)   = 10      = A
PRINT (2653-10*256)   = 93
PRINT INT(93/16)      = 5       = 5
PRINT (93-5*16)       = 13      = D = 2A5D hex
```

The convention for storing addresses in machine code is that they should always be in a Lo-byte, Hi-byte order. So 10845 would be stored as 5D,2A and not as 2A,5D.

A program with all two-byte addresses will be slower to run than one containing only one-byte addresses, but having only one byte to represent an address means a maximum 255 — one page — of memory. To speed things up, we take the first 256 bytes of memory — 0000 00FF — and call them the zero-page — due to the page number being equal to zero.

A lot of both business and games programs use machine code to move through memory one byte at a time. Word processors have a cursor rushing through sheets of text and Space Invader games have a running total of the number of bullets on the screen at a time. To do this in Basic, we would have something to the tune of

FORA=0TON : POKEA,X : NEXT

Notice the use of A as an address which varies. This is an indirect Poke; load X into the byte whose address is stored in the variable A; to convert this into machine code it would be best then to use an indirect command pre- or post-indexed with either X or Y respectively.

Try moving a character across and down the screen on a Vic. The screen is larger than 256 bytes so we are going to have to use a Lo-byte Hi-byte system and increment it as we move our * across. But first, advanced adding up should be considered.

When adding up in two bytes we can still use the ADC — Add with carry — command which can be thought of as

ADC : A = A + (data) + (carry)

Add the data represented in the ADC command to the contents of the accumulator and then add the contents of the carry flag — either 0 or 1.

To add in two bytes we add the Lo-bytes, store them and then add the Hi-bytes. Simple? Not quite. We need some way of telling whether the total of the two Lo-bytes came to more than 255 so that we can either add an extra 255 in the form of incrementing the Hi-byte total or not as the case may be. Enter the carry flag. The adding of the carry flag, which at first seemed to be a nuisance now makes sense in that in a two-byte addition, if the sum of Lo-bytes is greater than 255 this is automatically taken care of in the Hi-byte stage thanks to the ADC command adding the carry flag for us. A flowchart can now be translated into machine code.

Figure 1.

```
OPCODE  MNEMONIC  BASIC EQUIVALENT
A2 00   LDX #0    10 X=0
A0 00   LDY #0    20 Y=0
C8      INY       30 Y=Y+1
D0 FD   BNE FD    40 IF Y<> 256 THEN 30
E8      INX       50 X=X+1
D0 F8   BNE F8    60 IF X<> 256 THEN 20
60      RTS       70 RETURN
```

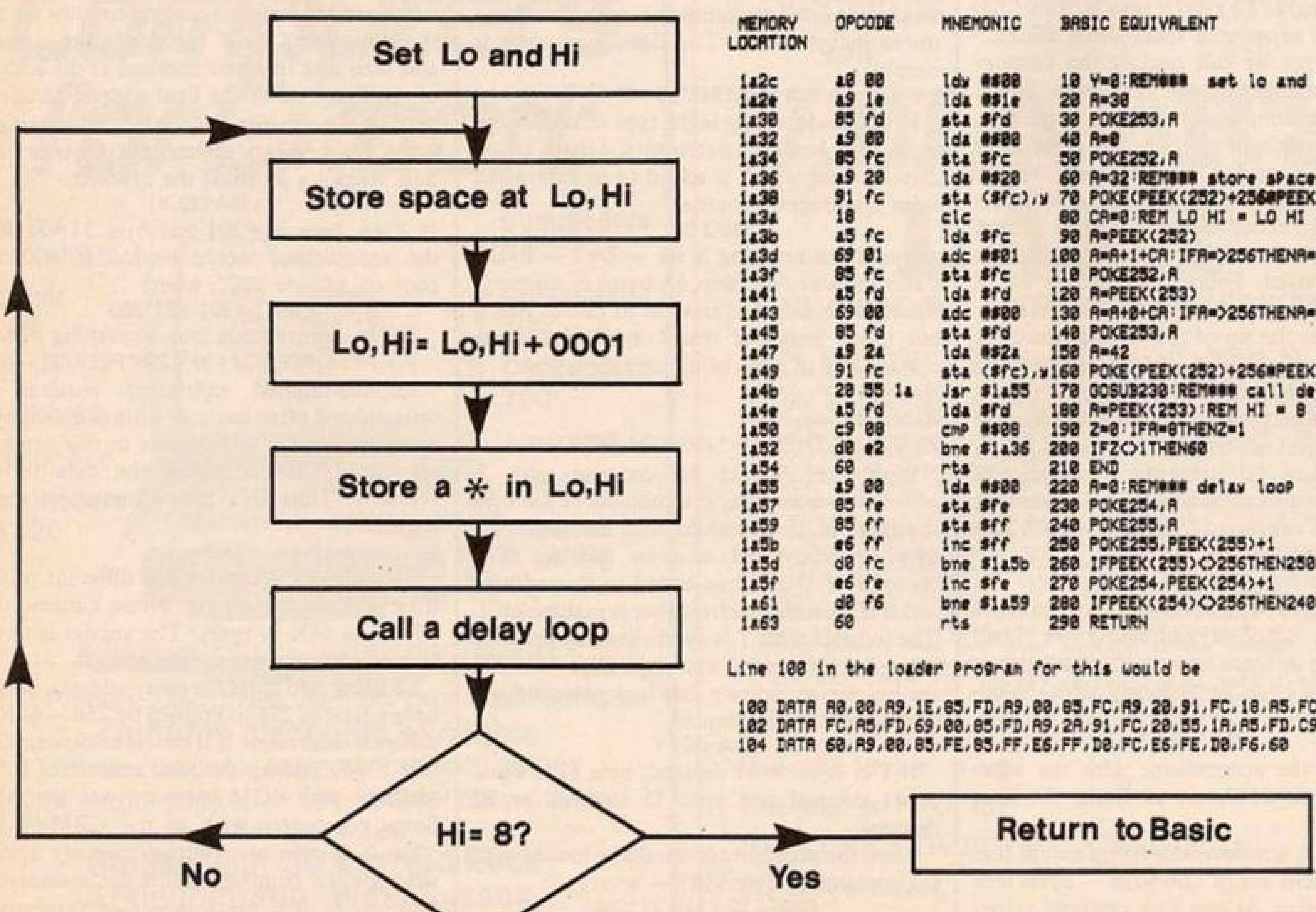
Figure 2.

```
OPERAND  MNEMONIC  BASIC EQUIVALENT
A9 00    LDA #0    10 A=0
85 FE    STA FE    20 POKE254,A
85 FF    STA FF    30 POKE255,A
E6 FF    INC FF    40 POKE255,PEEK(255+1)
D0 FC    BNE FC    50 IFPEEK(255)<>0THEN40
E6 FE    INC FE    60 POKE254,(PEEK(254)+1)
D0 F6    BNE F6    70 PEEK(254)<70THEN30
60       RTS       80 RETURN
```

Figure 3.

```
MEMORY    OPCODE    MNEMONIC   BASIC
LOCATION
1A2C      A9 00     LDA #0F    10 A=15
1A2E      8D 0E 90  STA 900E   20 POKE 36878,A
1A31      A2 FF     LDX #FF    30 X=255
1A33      A0 00     LDY #0     40 Y=0
1A35      CA        DEX        50 X=X-1
1A36      8E 0A 90  STX 900A   60 POKE 36874,X
1A39      8C 0B 90  STY 900B   70 POKE 36875,X
1A3C      20 42 1A  JSR 1A42   80 GOSUB 120
1A3F      C8        INY        90 Y=Y+1
1A40      D0 F3     BNE 1A34   100 IF Y<>256THEN 50
1A42      60        RTS        110 END
1A43      A9 00     LDA #0     120 REM
1A45      85 FE     STA FE     130 REM
1A47      85 FF     STA FF     140 REM
1A49      E6 FF     INC FF     150 REM
1A4B      D0 FC     BNE 1A48   160 REM
1A4D      E6 FE     INC FE     170 REM
1A4F      D0 F6     BNE 1A47   180 REM
1A51      60        RTS        190 REM
```

Figure 4. The flowchart on the left is coded up on the right.



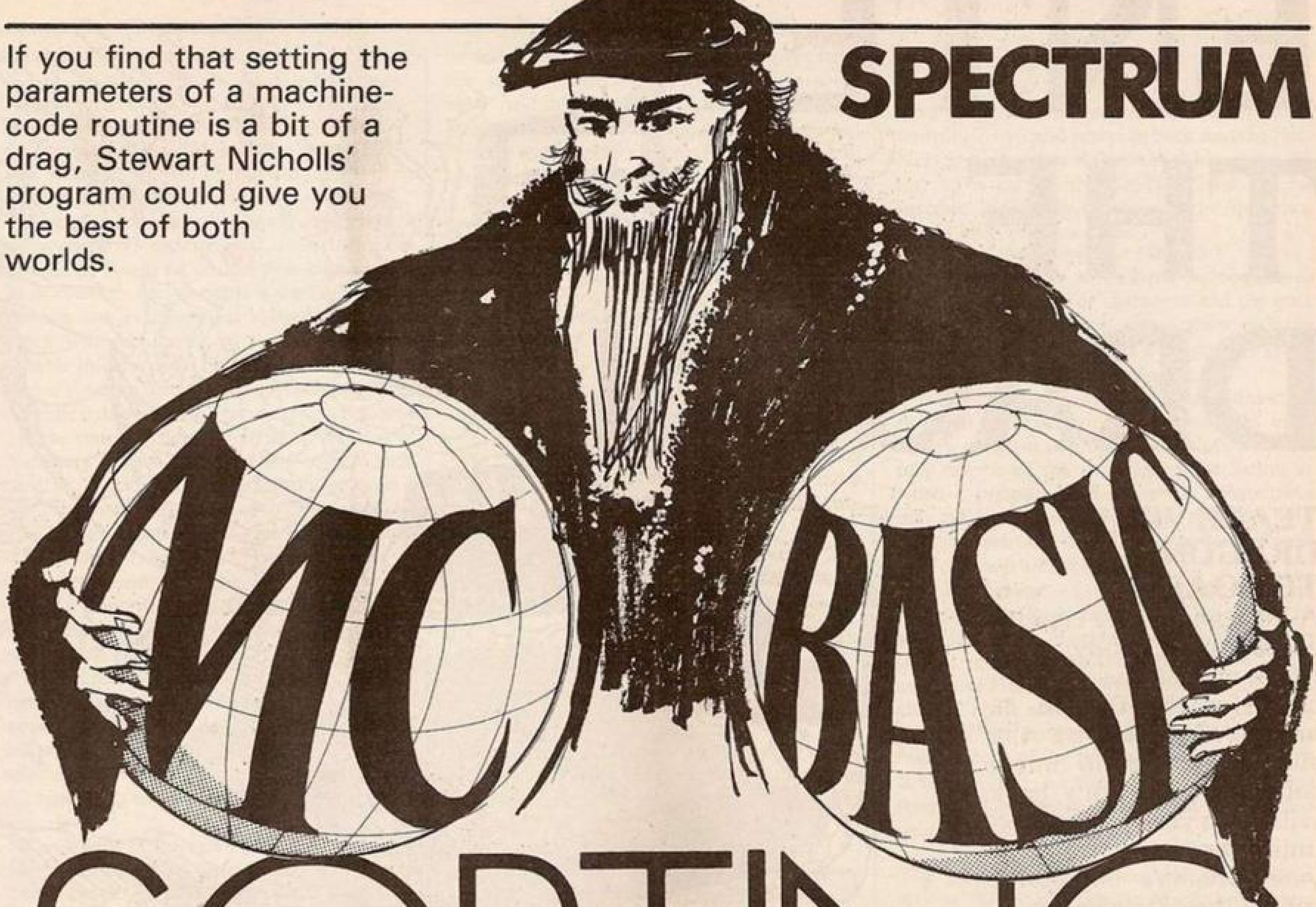

```
MEMORY    OPCODE    MNEMONIC      BASIC EQUIVALENT
LOCATION
1a2c      a0 00     ldy #$00      10 Y=0:REM*** set lo and hi
1a2e      a9 1e     lda #$1e      20 A=30
1a30      85 fd     sta $fd       30 POKE253,A
1a32      a9 00     lda #$00      40 A=0
1a34      85 fc     sta $fc       50 POKE252,A
1a36      a9 20     lda #$20      60 A=32:REM*** store space at lo,hi
1a38      91 fc     sta ($fc),y   70 POKE(PEEK(252)+256*PEEK(253)+Y),a
1a3a      18        clc           80 CA=0:REM LO HI = LO HI + 0001
1a3b      a5 fc     lda $fc       90 A=PEEK(252)
1a3d      69 01     adc #$01      100 A=A+1+CA:IFA=>256THENA=A-256:CA=1
1a3f      85 fc     sta $fc       110 POKE252,A
1a41      a5 fd     lda $fd       120 A=PEEK(253)
1a43      69 00     adc #$00      130 A=A+0+CA:IFA=>256THENA=A-256:CA=1
1a45      85 fd     sta $fd       140 POKE253,A
1a47      a9 2a     lda #$2a      150 A=42
1a49      91 fc     sta ($fc),y   160 POKE(PEEK(252)+256*PEEK(253)+Y),a
1a4b      20 55 1a  jsr $1a55     170 GOSUB230:REM*** call dealay loop
1a4e      a5 fd     lda $fd       180 A=PEEK(253):REM HI = 8 ?
1a50      c9 08     cmp #$08      190 Z=0:IFA=8THENZ=1
1a52      d0 e2     bne $1a36     200 IFZ<>1THEN60
1a54      60        rts           210 END
1a55      a9 00     lda #$00      220 A=0:REM*** delay loop
1a57      85 fe     sta $fe       230 POKE254,A
1a59      85 ff     sta $ff       240 POKE255,A
1a5b      e6 ff     inc $ff       250 POKE255,PEEK(255)+1
1a5d      d0 fc     bne $1a5b     260 IFPEEK(255)<>256THEN250
1a5f      e6 fe     inc $fe       270 POKE254,PEEK(254)+1
1a61      d0 f6     bne $1a59     280 IFPEEK(254)<>256THEN240
1a63      60        rts           290 RETURN
```

Line 100 in the loader program for this would be

```
100 DATA A0,00,A9,1E,85,FD,A9,00,85,FC,A9,20,91,FC,18,A5,FC,69,01,85
102 DATA FC,A5,FD,69,00,85,FD,A9,2A,91,FC,20,55,1A,A5,FD,C9,08,D0,E2
104 DATA 60,A9,00,85,FE,85,FF,E6,FF,D0,FC,E6,FE,D0,F6,60
```

SPECTRUM

If you find that setting the parameters of a machine-code routine is a bit of a drag, Stewart Nicholls' program could give you the best of both worlds.



SORTING VARIABLES

DO YOU GET tired of having to set parameters of a machine-code routine by Poking numerous addresses with the necessary values? If you do, the following machine-code routine is the answer: it makes Poking completely unnecessary.

The problem is avoided by setting up the values using Basic variables and then searching the variables area to find their value and storing them in the spare bytes of the printer buffer.

To demonstrate the technique, I have attached the search program to a routine which prints a message anywhere on the screen using characters of any height or width, in any ink colour.

The x and y variables are used for the start of the message; since these are the co-ordinates of the top-left corner of the first character of the message the usual Spectrum plot positions apply. That is, 0,0 is the bottom left-hand corner of the screen. For the height of the characters, h is used. Normal height is 1, 22 will be full screen. Width of characters is w. Normal width is 1, 32 is full screen for one character.

The string containing the message to be printed will be a$. The only limitations on the message are that it can only contain characters from code 32 — space — to code 127 — copyright — and that the number of characters multiplied by width of character should not exceed 32 with the Plot position at the left-hand edge of screen. If this is exceeded the program will not crash but the message will wrap round the screen overprinting as it goes.

The program is fully mug-trapped and any wrong parameter of x and y will be corrected before plotting the string. The machine code to find the variables x, y, h, w and a$ is shown in listing 1.

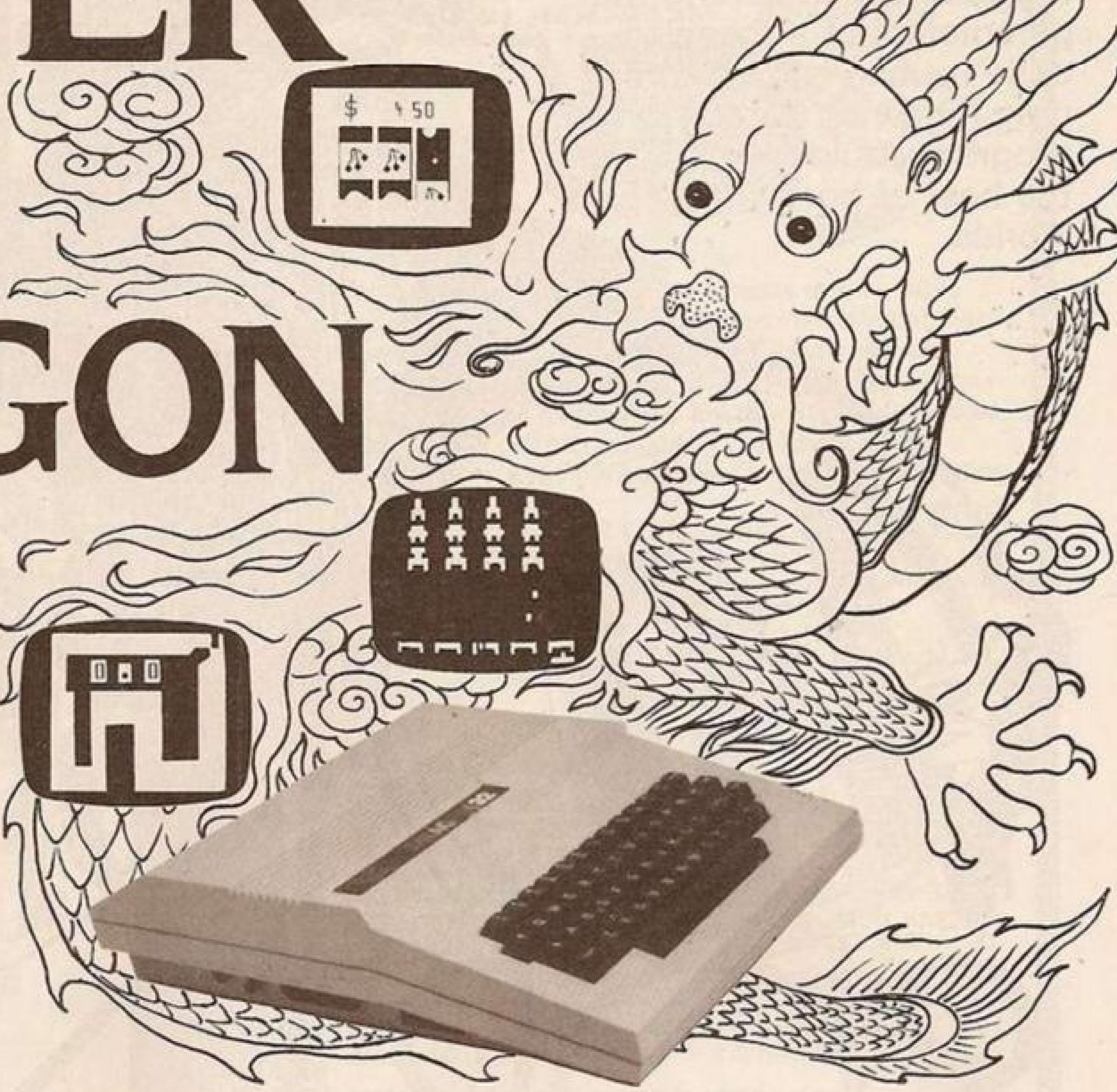
If you read through Chapter 24 of the Sinclair Manual you will see that there are six types of variable, namely: a number whose name is one letter — type (i); a number whose name is two or more letters — type (ii); an array of numbers — type (iii); For-Next loop control — type (iv); string variable — type (v); an array of characters — type (vi).

Each of these variables is uniquely identified by its first byte.

Variable type i = 96d + (letter code - 96d)
Variable type ii = 160d + (first letter code - 96d)

(continued on page 137)

ENTER THE DRAGON



TEACH YOUR DRAGON TO ROAR!

A fresh and highly creative collection of ready made programs designed specifically for the **Dragon 32** micro. Created by the sharpest minds in micro software today, this book will teach you how to maximise the entire range of your Dragon's impressive capabilities. Using easy-to-follow program listings, this book turns your Dragon 32 into a complete arcade of fast action space and adventure games. All your favourites are there including: **Dragon Invaders, Lunar Lander** and **Astral Storm,** plus there's an entire collection of fresh and exciting new games!

Each program fully extends the excellent colour resolution of the Dragon to its maximum and the action is faster than you ever thought possible.

Your overall knowledge of computer operation will be expanded too. Each program features an in-depth explanation of how and why it runs and illustrations of screen displays back up the text to ensure you understand exactly what will be achieved.

The book even includes many programming tips and hints usually reserved only for the experts. So whether you are a first-time computer user or an 'old hand' if you want to make your Dragon really perform, and feel the satisfaction of doing it yourself, this is the book that will show you how!

MELBOURNE HOUSE PUBLISHERS

Orders to: 131 Trafalgar Road, Greenwich, London SE10

Correspondence to: Glebe Cottage, Station Road, Cheddington, Leighton Buzzard, BEDS LU7 7NA

Trade enquiries welcome.

☐ Please send me your **free** catalogue.

Please send me:

Books

SPECTRUM

- ☐ Understanding Your Spectrum £7.95
- ☐ Spectrum Machine Language for The Absolute Beginner £6.95
- ☐ Over the Spectrum £6.95
- ☐ The Complete Spectrum ROM Disassembly £9.95
- ☐ Spectrum Hardware Manual £5.95

DRAGON

- ☐ Enter the Dragon £5.95

ZX81

- ☐ Machine Language Made Simple for the ZX80 & ZX81 £8.95
- ☐ Not Only 30 Programs £4.95
- ☐ Understanding Your ZX81 ROM £8.95
- ☐ Complete Sinclair Basic Course £17.50
- ☐ Basic Course cassettes £2.50
- ☐ Complete Sinclair ZX81 ROM Disassembly Part A & B £9.95
- ☐ Ins and Outs of the ZX81 £5.95

VIC 20

- ☐ VIC Innovative Computing £6.95

Cassettes

16K SPECTRUM

- ☐ Over The Spectrum No. 1 £5.95
- ☐ Over The Spectrum No. 2 £5.95
- ☐ Over The Spectrum No. 3 £5.95
- ☐ Programs from Spectrum Machine Language Book £5.95

DRAGON 32

- ☐ Enter The Dragon Super Cassette A £5.95
- ☐ Enter The Dragon Super Cassette B £5.95

48K SPECTRUM

- ☐ Penetrator £6.95
- ☐ The Hobbit £14.95
- ☐ Terror Daktil 4D £6.95

STANDARD VIC 20

- ☐ VIC Innovative Cassette 1 £5.95
- ☐ VIC Innovative Cassette 2 £5.95
- ☐ VIC Innovative Cassette 3 £5.95
- ☐ VIC Games Pack £5.95
- ☐ The Wizard & The Princess £5.95

All prices include VAT where applicable

£ ______

Please add 80p for post and pack £ .80

TOTAL £ ______

All Melbourne House cassette software is unconditionally guaranteed against malfunction.

Access orders can be telephoned through on our 24-hour ansafone (01) 858 7397.

I enclose my cheque/money order for £ ______

Please debit my Access card No. ______ Expiry date ______ Signature ______

Name ______ Address ______

______ Postcode ______ YC5

MELBOURNE HOUSE PUBLISHERS

(continued from page 135)

Variable type iii = 128d + (letter code - 96d)
Variable type iv = 224d + (letter code - 96d)
Variable type v = 64d + (letter code - 96d)
Variable type vi = 192d + (letter code - 96d)

The variables we will be searching for will be types (i) and (v).

If we take, for example, the variable x which has a character code of 120, then using the formula (i) given, its unique first byte is 120. So in order to find variable x we must search through the variables for this unique code, which will then point to the start of the x variable information. This is not just a simple case of running through the variables one byte at a time using a CPIR instruction, as this may find the code 120 held in a string or an array of characters. So we must find the start of each variable, check if it is the one we want, and if not, then jump to the start of the next variable. This means that we must identify the type of variable found before we know how far to jump to the next one. This is not as difficult a task as it might first appear because of the way in which the Spectrum stores the variable parameters.

With three of the variables, namely array of numbers, array of characters and strings, the length of the variable is held in the two bytes following the unique code byte. What is more helpful, bit 5 of the unique code is zero and the remaining three variables have bit 5 set at one

The length of the three remaining variables can be calculated by this method:

Type (i) length = 6 bytes including unique code.
Type (ii) length = number of letters of variable + 5 bytes
Type (iv) length = 19 bytes including unique code.

We now have the information to enable us to jump over each type of variable, and the checks must be made in the following order: first, check if code is 120; if yes then return from routine; check bit 5 and if zero jump by

value in next two bytes + 1 : GOTO 1

Check bit 6 and if zero check following bytes for

BIT 7 = 1

that is the last character of the variable, then jump six bytes and Goto 1. Check bit 7 and if zero then jump 6 bytes and Goto 1. Now it must be a For/Next loop so jump 19 bytes and Goto 1.

The mnemonics of the machine-code program to do this are shown in the Find subroutine. This uses address 23728 to hold the unique code of the variable for which we are searching. The HL register holds the address being checked, and the accumulator is loaded with the unique code from address 23728.

The subroutine only takes 46 bytes to check, Jump and locate the start address of any variable.

Now that we have found the start address of our variable x we must find its value. You will see that the value for whole numbers is held in the third and fourth bytes following the unique code. In our case we are only interested in numbers from 0 to 255 for x. So we can ignore the high byte and store the low byte, that is the third byte. This applies to all our variables x, y, h and w.

With this in mind a subroutine, Setup, can be assembled to move along three bytes from the address held in HL and then store the value held in this address in the printer buffer area of memory. So we now have the means of finding and storing values of x, y, h and w in addresses 23296/7/8 and 9.

We can now move to the slightly more complicated string parameters. In our case we need to find a$, unique code 65. The same Find routine can be used to find the start of the variable. Once found we then move to the next two bytes to find the LEN of the string as follows:

```
INC HL
LD E,(HL)
INC HL
LD D,(HL)
```

This will put the length of the string into the DE register, and, as we can safely limit the length of the string to 255 characters we only need to store the number in low byte:

```
LD (23300),DE
```

The number in address 23301 will be overwritten with the first character in the string:

```
PUSH DE      Get number of characters into
             BC
POP  BC
INC  HL      Set Hl at start of characters
LD   DE,23301
LDIR         Transfer information
```

The above will transfer the string characters from the variables to the printer buffer starting at address 23301.

With this routine we now have x, y, h, w, length of string, and characters in string stored consecutively in the printer buffer, and can go straight into the routine to plot the string based on these parameters.

The plot routine finds the start of the eight bytes for each character in the character set and, for each byte, a Rotate Left instruction is carried out either plotting or unplotting depending whether Carry is set or not. Again use is made of the two unused bytes in the Systems Variables 23728/9 to hold and update the x,y plot positions for each character.

If the y plot position goes below zero, then it is reset to 175 to give a wrap around effect and likewise if the x position goes above 255 it is reset to zero. So now we have a machine-code program that can be called from Basic with no Pokes in sight — for example:

```
10 LET x = 0 : LET y = 100 : LET h = 8 :
   LET w = 4 : LET a$ = "Finished" : INK 6 :
   RANDOMISE USR 32393
```

This saves 13 Pokes including LEN a$. Listing 1 shows the Basic program to set up the machine code above RAMtop. On a 16K Spectrum this is immediately before the user-defined graphics and occupies 255 bytes. Once the machine-code is entered the Basic can be Newed and the code saved in the usual way.

There are a couple of points to watch with this program. First, ensure that all the variables are defined before a call is made to the routine as failure to find a variable will crash the program. Second, Do not use x, y, h, or w as a control variable for a For-Next loop because the Spectrum will then delete the simple variable and use the For-Next loop to hold further values of x, y, h and w. This can be demonstrated by the simple Basic program:

```
10 FOR a = 1 TO 10
20 PRINT a ;
30 NEXT a
40 LET a = 3
50 NEXT a
```

This program will produce a continuous loop resetting a to 3 and jumping back into the For-Next loop showing that the variable — a — in line 40 is part of the For-Next loop control variable. If this was not the case the Spectrum would give an error report:

1 NEXT without FOR, 50:1

You can have a small Basic subroutine to work out the width of characters and the start plot position to give information printed centrally on any line; such a program is given in listing 2 with sample printout.

We can now also tackle a machine-code program to print out all the variables used after a program has been Run. Note that this may not be all the variables in the listing as when a program is Run certain subroutines may not have been called and so variables held in those routines will not have been placed into the variables area.

This program — listing 3 — could be of use in debugging Basic programs. Listing 3 is in the form of a machine-code dump which should be held in Data statements as listing 1, and Poked into a memory position of your choice. There are no Jump or Call commands to within the program. I find it handy to have two versions of the program one stored above RAMtop and another in a line 1 Rem statement containing 311 zeros and called using

RANDOMISE USR 23760

The machine-code is then held in the Basic area of RAM and can be Merged with any program — as long as the program does not have a line 1, which will be overwritten. One point to note when Saving the Basic Rem statement on tape is to use Clear to erase all variables used in the machine-code loader, otherwise these will be saved and Merged along with the Rem statement. This is good practice on any program which does not require the variables to be saved.

Listing 4 is a demonstration program setting up variables, and shows a screen copy of the machine-code output which lists these variables under their variable types. Notice how the Spectrum converts all variables to lower case and also that variables a, h, l, o, w, x and z have been listed under the For-Next loop only and not under number.

Listing 5 shows the machine-code mnemonics for assembly into a Rem statement, for anyone who wishes to check through the program to see how it works. The first section from address 5CD0 to 5CE5 sets up the Border, Paper and Ink colours; from 5CE6 to 5D46 prints the heading. The remainder of the program checks the variables one by one finding the type of variable, locating the next Print position in that variables column, updating the Print position and printing the variable.

The section from 5D94 to 5DBE is interesting in that it checks for a column reaching the bottom of the screen and if it does then waits for a key press before scrolling 21 lines, leaving the heading on the screen and printing the next variable in position. A return to Basic is only made when all the variables have been listed.

(continued on page 140)

Eltec Computers

HOME & BUSINESS TECHNOLOGY

Probably the widest selection of software available by mail order.

All the top manufacturers including **Acorn Soft**, IJK (Sinclair), Superior Software, Bug Byte, Program Power, Hessel, Procyon.

HERE IS A SELECTION

Peeko Computer	9.95
Junior Maths Pack	6.84
Philosopher's Quest	9.95
Planetoid	9.95
Meteors	9.95
Arcadians	9.95
Swoop	7.99
Chess Model B	7.99
Space Invaders Model B The best	6.95
Atlantis — Superb fast Action 32K	6.95
Hyperdrive 32K	5.95
Stratobomber	6.95

Send SAE for full list.

HARDWARE EXPANSION

Sound pick-off module (simple to fit)	6.95
Amplifier and loudspeaker suitable for above	37.50
Light pen	34.50
X-Y digitiser	80.00

SUPER ACCESSORIES

Cover Polyester Cotton	3.97
Cover Soft PVC	4.45
Carrying Case for Computer, Cables, Cassette/Disc Drive	55.20
Carrying Case a soft supported nylon version of above	23.00

BBC models A & B in stock:
A – £299 B – £399

DISK DRIVES FOR BBC

BBC 100K Single drive (Requires discs (a))	265.00
TORCH Z80 800K Disc pack includes Z80 proc'r + 64K (b)	897.00
BBC/LVL 200K Twin Drive (a)	397.00
TEAC 200K Single Drive (a)	304.75
TEAC 400K Twin Drive (a)	569.25
TEAC 400K Single Drive (b)	396.75
TEAC 800K Twin Drive (b)	711.85
Connecting cable for TEAC drives	17.25
(a) SCOTCH Single sided discs Box of 10	28.75
(b) SCOTCH Double sided discs Box of 10	39.80

BBC UPGRADES

Full upgrade kit (fitting £31.00)	69.00
Disc interface (fitting £15.00)	109.25

The above prices are VAT inclusive. Add £1.00 p&p for orders below £100.00 and £10.00 (Securicor delivery) for orders above £100.00.
Access and Barclaycard accepted on all items except BBC computers.

ELTEC COMPUTERS
217 Manningham Lane, Bradford, BD8 7HH.
Tel (0274) 722512.

HOME/ PERSONAL/ BUSINESS/ SCHOOL

Announcing:

THE DRAGON 32

Database management Filing System

The Program — That everyone can use!

Extensive facilities include Add Records. Change Records. Delete Records. Set up Records. Sought Records. Find Records. Calculations. List Records. Print Records. Summarised Records.
Save File on Cassette (up to 500 records).

The Program . . . comes with comprehensive documentation and is recorded on both sides of a computer quality C15 Computer Tape. A demonstration File is also included on the tape.

Only £19.95 (fully inclusive)

Other Dragon titles include Mail List, Stock Control, Business Accounting, Bank Accounting, Invoices and Statements

*** Special Offer ***

All six programs £99.95
Access and Dealer Enquiries welcome 03952 5832

GEMINI MARKETING LTD
9 Salterton Road, Exmouth, Devon EX 8 2BR

TRANSFORM LTD.

ZX Business Software.

FOR SMALL BUSINESSES AND THE SELFEMPLOYED

Business Bank Account 1: this program enables you to make debits under 11 subheadings. Statements include totals of all sub-headings. **£8.75**

Business Bank Account 2: with 15 subheadings and standing orders. **£10.75**

Sales Day Book 1: for all your invoices, this program will enable you to prepare statements of outstanding invoices. Program will also calculate VAT. **£8.75**

Sales Day Book 2: with many extra facilities including totals of past 12 periods. **£10.75**

Sales Cash Book: for retailers program calculates VAT and denotes method of payment. **£8.75**

Purchase Day Book 1: keeps a complete record of all your purchases under 11 subheadings. The program will also calculate and deduct VAT. **£8.75**

Purchase Day Book 2: with many extra facilities including totals of past 12 periods. **£10.75**

Quarterly Analysis: quarterly totals from Bank Account, Purchase and Sales programs can be analysed with this program. **£4.75**

• All the programs have full search facilities •

Business Pack 1: incl. Bank Account 1, Sales 1, Purchase 1 and quarterly analysis programs **£25.00**

Business Pack 2: incl. all 4 programs **£30.00**

Please specify memory size when ordering for your ZX81 or ZX spectrum.

ALL PRICES include VAT post & packaging for details send SAE to

TRANSFORM LTD
41 Keats Ho Porchester Mead Beckenham, Kent.
Tel: 01-658 1661

(continued from page 137)

Start address for 16K machine code 32235.
ORG 32335
Subroutine to find variables.

```
[redacted] LD   HL,(23627)
START  LD   A,(23728)
       CP   (HL)
       RET  Z
       BIT  5,(HL)
       JR   NZ,NEXT
       INC  HL
       LD   E,(HL)
       INC  HL
       LD   D,(HL)
       ADD  HL,DE
       INC  HL
       JR   START
NEXT   BIT  6,(HL)
       JR   NZ,NEXT1
LOOP5  INC  HL
       LD   A,(HL)
       BIT  7,A
       JR   Z,LOOP5
LOOP6  LD   DE,6
       ADD  HL,DE
       JR   START
NEXT1  BIT  7,(HL)
       JR   Z,LOOP6
       LD   DE,19
       ADD  HL,DE
       JR   START
```

Subroutine to set parameters of variable to be found.

```
[redacted] LD   (23728),A
       CALL [redacted]
       INC  HL
       INC  HL
       INC  HL
       LD   A,(HL)
       LD   (BC),A
       RET
```

Start of machine-code routine.

```
[redacted] LD   BC,23296
       LD   A,120          LD   (23728),A
       CALL [redacted]     CALL [redacted]
       INC  BC             INC  HL
       LD   A,121          LD   E,(HL)
       CALL [redacted]     INC  HL
       INC  BC             LD   D,(HL)
       LD   A,104          LD   (23300),DE
       CALL [redacted]     PUSH DE
       INC  BC             POP  BC
       LD   A,119          INC  HL
       CALL [redacted]     LD   DE,23301
       LD   A,65           LDIR
```

Routine to plot the string.

```
       LD   HL,(23296)
       XOR  A
       LD   A,H
       SBC  176
       JR   C,YES
       LD   H,A
       LD   (23296),HL
YES    LD   (23728),HL
       LD   HL,23301
RUN1   PUSH HL
       LD   A,(HL)
       LD   H,0
       LD   L,A
       ADD  HL,HL
       ADD  HL,HL
       ADD  HL,HL
       LD   DE,15360
       ADD  HL,DE
       LD   B,8
LOOP4  PUSH BC
       LD   BC,(23297)
LOOP3  LD   A,(HL)
       PUSH HL
       PUSH BC
       LD   B,8
LOOP2  PUSH BC
       RLA
       PUSH AF
       JP   C,PLOT
       LD   HL,(23299)
       LD   A,(23728)
       ADD  L
       LD   (23728),A
       JP   END
PLOT   LD   BC,(23298)
LOOP1  PUSH BC
       LD   BC,(23728)
       PUSH BC
       CALL 22E5H
       POP  BC
       INC  C
       LD   (23728),BC
       POP  BC
       DJNZ LOOP1
END    POP  AF
       POP  BC
       DJNZ LOOP2
       LD   A,(23296)
       LD   HL,23728
       LD   (HL),A
       INC  HL
       XOR  A
       LD   A,(HL)
       SBC  176
       JR   C,OK
       LD   (HL),A
       JR   CONT
OK     LD   A,(HL)
       CP   0
       JR   NZ,OK1
       LD   (HL),176
OK1    DEC  (HL)
CONT   POP  BC
       POP  HL
       DJNZ LOOP3
       INC  HL
       POP  BC
       DJNZ LOOP4
       LD   A,(23299)
       ADD  A
       ADD  A
       ADD  A
       LD   L,A
       LD   A,(23728)
       ADD  L
       LD   (23296),A
       LD   (23728),A
       LD   A,(23297)
       LD   (23729),A
       POP  HL
       INC  HL
       LD   A,(23300)
       DEC  A
       RET  Z
       LD   (23300),A
       JP   RUN1
       END
```

Listing 1.

```
   1 REM x=x axis
   2 REM y=y axis
   3 REM h=height
   4 REM w=width
   5 REM a$=message
  10 CLEAR 32334
  20 LET start=32335
  30 FOR a=start TO 32599
  40 READ code
  50 POKE a,code
  60 NEXT a
  70 DATA 42,75,92,58,176,92,190
,200,203,110,32,8,35,94,35,86,25
,35,24,239,203,118,32,12
  80 DATA 35,126,203,127,40,250,
17,6,0,25,24,223,203,126,40,246,
17,19,0,25,24,213,50,176
  90 DATA 92,205,79,126,35,35,35
,126,2,201,1,0,91,62,120,205,125
,126,3,62,121,205,125,126
 100 DATA 3,62,104,205,125,126,3
,62,119,205,125,126,62,65,50,176
,92,205,79,126,35,94,35,86
 110 DATA 237,83,4,91,213,193,35
,17,5,91,237,176,42,0,91,175,124
,222,176,56,4,103,34,0
 120 DATA 91,34,175,92,33,5,91,2
29,126,38,0,111,41,41,41,17,0,60
,25,6,8,197,237,75
 130 DATA 1,91,126,229,197,6,8,1
97,23,245,218,249,126,42,3,91
 140 DATA 58,176,92,133,50,176,9
2,195,15,127,237,75,2,91,197,237
,75,176,92,197,205,229,34,193
 150 DATA 12,237,67,176,92,193,1
6,238,241,193,16,211,58,0,91,33,
176,92,119,35,175,126,222,176
 160 DATA 56,3,119,24,8,126,254,
0,32,2,54,176,53,193,225,16,177,
35,193,16,168,58,3,91,135,135,13
5,111,58,176,92,133
 170 DATA 50,0,91,50,176,92,58,1
,91,50,177,92,225,35,58,4,91,61,
200,50,4,91,195,206,126
 200 LET x=0: LET y=100: LET h=8
: LET w=4: LET a$="Finished"
 210 RANDOMIZE USR 32393
 220 STOP
9999 SAVE "large" LINE 1
```

Example program — listing 2.

```
  10 LET x=0: LET y=175
  20 LET h=4
  25 FOR l=1 TO 5
  30 READ a$
  40 LET w=INT (32/LEN a$)
  50 LET x=INT ((256-(8*w*LEN a$
))/2)
  60 RANDOMIZE USR 32393
  70 LET y=y-8*h
  80 NEXT l
  85 LET y=y+24
  86 READ a$: RANDOMIZE USR 3239
3: STOP
  90 DATA "Program:PLOT","©1983
S.Nicholls","*******************
***************","YOUR COMPUTER","
APRIL 1983","________________"
```

(continued on page 142)

ONLY 19·95 +£1·00pp

....Introducing the AGF JOYSTICK INTERFACE II for sinclair ZX Spectrum 81

ABOUT OUR JOYSTICK INTERFACE

Following in the footsteps of our extremely popular original interface, which has sold over 1,000 worldwide since October last year, we have improved its performance.

The Interface Module II has been specially designed to plug on to the rear connector of your ZX Spectrum or ZX81 and allow you to connect any standard Atari type digital Joysticks. All of the computer's connections are duplicated on an extension connector so that you can still use any other devices intended for use with your computer.

The Interface Module II resides in the same memory space as the keyboard, which remains fully functional at all times, therefore it will not interfere with anything else connected.

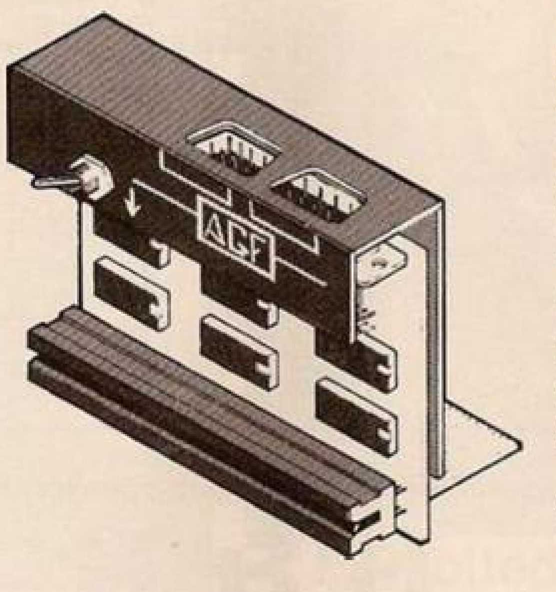
When a suitable joystick is plugged into 'Player 1' socket its action will mimic pressing the cursor keys, up "7", left "5" and so on. The firing button will simulate key ϕ. This unique feature guarantees the best software support.

Take a look at the selection of compatible games we have listed. More are being added all the time as a result of our contact with the various software companies.

A second Joystick may be connected in the 'Player 2' position which simulates in a parallel fashion keys T-Y-U-I-P. This will allow you to play a whole new generation of two player games.

An added advantage of using our Joystick Interface is that you relieve your keyboard of the key-thumping strain of game playing whilst increasing the enjoyment.

Using joystick control in your own programs is as easy as reading keys. Eight directions and Fire are all read by simple BASIC. With every order there comes a free demonstration program called 'Video Graffiti' plus a full set of instructions.



KEY FEATURES

- ★ Proven cursor key simulation for maximum software support
- ★ Accepts Atari, Competition Pro, Wico, Starfighter, Le Stick, etc Joysticks
- ★ Second Joystick facility
- ★ Eight directions programmed in simple BASIC
- ★ Rear extension connector for all other add-ons
- ★ Free demo program, 'Video Graffiti' + full instructions

A SELECTION OF COMPATIBLE SOFTWARE

ZX SPECTRUM

Abersoft		Mazeman
Axis		Labyrinth
Campbell Ststems		Gulpman
DK 'Tronics	☐	3D Tank £4.95
		Meteroids
ICL		Star Trail (Man.Dock)
New Generation	☐	Escape £4.95
Software	☐	3D Tunnel £5.95
Psion	*	Flight Simulation
		VU–3D
Silversoft		Ground Attack
	☐	Cyber Rats £5.95

ZX81

Artic	Galaxians
J.K. Greye	3D Monster Maze
P.S.S.	Krazy Kong
	Ghost Hunt
	Maze Drag Race
Silversoft	Asteroids

NB ☐ *Available from us, please tick*
* *Not suitable for original interface*

JOYSTICKS

ATARI CONTROLLERS

FOR USE WITH OUR INTERFACE Module II or VIC 20, Commodore 64, Atari VCS, Atari 400, Atari 800

If you require extra Joysticks for our original interface module mark order 'OLD' Joysticks

ONLY £7.54 inc VAT + P&P

FROM: MR/MRS/MISS

ADDRESS

SEND C.W.O. ONLY TO: A.G.F. HARDWARE, DEPT. YCR

26 VAN GOGH PLACE, BOGNOR REGIS, WEST SUSSEX PO22 9BY

QTY	ITEM	ITEM PRICE	TOTAL
	INTERFACE MODULE II	20.95	
	JOYSTICK(S)	7.54	
	SOFTWARE AS TICKED ON LIST		
	SOFTWARE AS TICKED ON LIST		
ZX81 ☐	ZX SPECTRUM ☐ Please tick	FINAL TOTAL	

DEALER ENQUIRIES WELCOME *EXPORT PRICES ON APPLICATION*

(continued from page 140)

Listing 4.

```
1 FOR a=1 TO 2: NEXT a
2 DIM b$(7)
3 LET c$="w"
4 DIM d(7)
5 LET e=1
6 LET details=1
7 LET A=1
8 LET B=1
9 LET C=1
10 LET D=1
11 LET E=1
12 LET F=1
13 LET G=1
14 LET H=1
15 LET I=1
16 LET J=1
17 LET K=1
18 LET L=1
19 LET M=1
20 LET N=1
21 LET O=1
22 LET P=1
23 LET Q=1
24 LET R=1
25 LET S=1
26 LET T=1
27 LET U=1
28 LET V=1
29 LET W=1
30 LET X=1
31 LET Y=1
32 LET Z=1
33 LET D$=";"
34 LET F$="2"
36 LET DEFINE=3
37 FOR L=1 TO 10: NEXT L
38 LET data=2
39 LET origin=3
40 LET print=1
50 LET help=1
51 LET a$="e"
52 LET g$="o"
53 DIM v$(8)
54 FOR h=1 TO 2: NEXT h
55 FOR w=34 TO 35: NEXT w
56 LET d$="a"
57 LET m$="i"
58 FOR x=1 TO 4: NEXT x
59 FOR z=1 TO 5: NEXT z
60 DIM s(1)
61 DIM f(7)
62 DIM j$(8,7)
63 DIM b(2)
64 FOR o=1 TO 2: NEXT o
66 LPRINT "DEMO BASIC PROGRAM"
67 LPRINT ''
68 LLIST
500 LPRINT '''"SCREEN COPY OF A
BOVE"
510 RANDOMIZE USR 31900
515 LPRINT ''
520 COPY
550 LPRINT '''"MACHINE CODE DUM
P"
560 LPRINT '''"MAY BE LOCATED AN
YWHERE IN      AVAILABLE MEMORY"
570 LPRINT '''
600 FOR a=31900 TO 32210 STEP 8
610 FOR b=0 TO 7
620 LPRINT TAB b*4;PEEK (a+b);
630 NEXT b: NEXT a: STOP
9998 CLEAR 31899: LOAD ""CODE :
GO TO 1
9999 SAVE "basicvars" LINE 9998:
 SAVE "variables"CODE 31900,312
```

Screen copy of listing 4.

```
FN█ $()██NO.()█NO.█(WORD) NO.
a    b    c    d    e    details
h    v    f    s    b    define
l    j    a    f    c    data
o         g    b    d    origin
w         d         f    print
x         m         g    help
z                   i
                    j
                    k
                    m
                    n
                    p
                    q
                    r
                    s
                    t
                    u
                    v
                    v
                    w
```

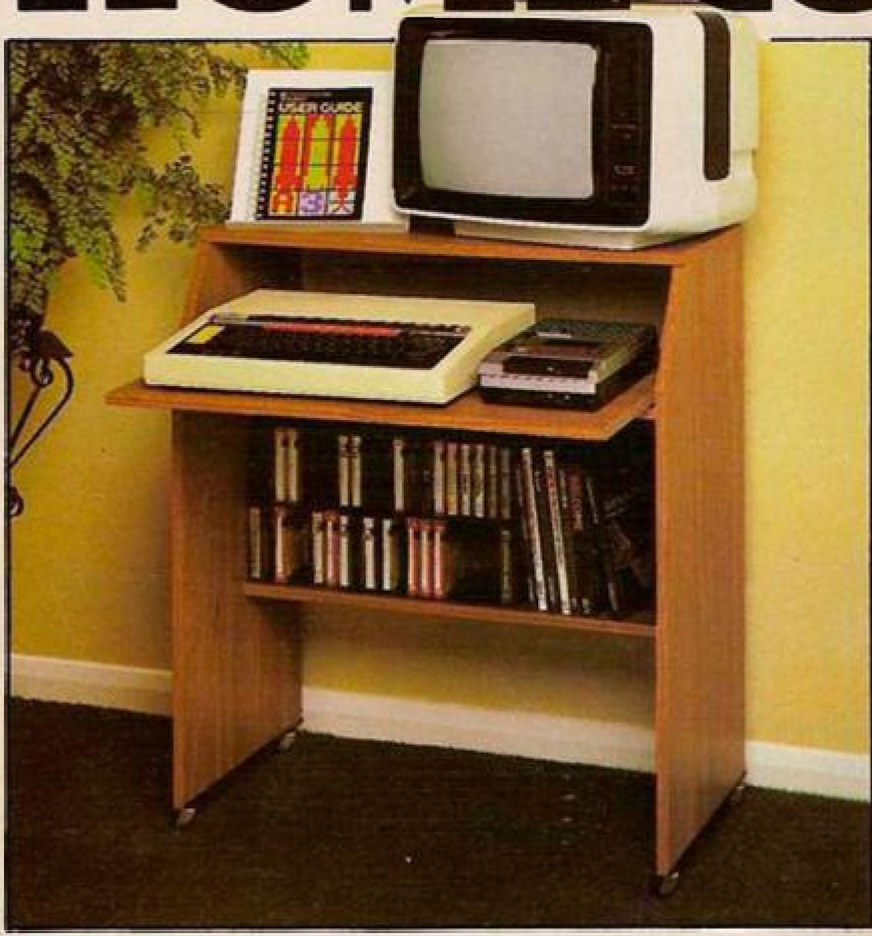
Listing 3.

```
62  1   205 155 34  253 54  83
15  62  2   205 1   22  205 107
13  62  2   205 1   22  62  22
215 175 215 175 215 62  70  215
62  78  215 62  143 215 62  32
215 62  36  215 62  40  215 62
41  215 62  143 215 62  36  215
62  143 215 62  70  215 62  79
215 62  46  215 62  40  215 62
41  215 62  143 215 62  78  215
62  79  215 62  46  215 62  143
215 62  40  215 62  87  215 62
79  215 62  62  215 62  68  215
62  41  215 62  32  215 62  78
215 62  79  215 62  46  215 6
14  62  2   33  0   91  119 35
16  252 6   6   175 33  3   91
119 35  35  198 4   16  249 42
75  92  34  176 92  17  2   91
126 254 128 200 230 224 254 224
40  30  19  19  254 192 40  24
19  19  254 64  40  16  19  19
254 128 40  12  19  19  254 96
40  6   19  19  24  2   24  210
237 83  0   91  26  254 22  32
38  229 213 118 253 203 1   110
40  249 253 203 1   174 6   21
205 0   14  6   6   33  2   91
53  126 254 1   32  1   52  35
35  16  245 209 225 24  209 126
230 31  198 96  245 62  2   205
1   22  62  22  215 42  0   91
126 52  215 35  126 215 241 215
42  176 92  203 110 32  6   35
94  35  86  25  35  24  167 203
118 32  16  35  126 203 127 32
3   215 24  247 230 127 215 17
6   0   25  24  145 203 126 40
246 17  19  0   25  24  135 0
```

Listing 5.

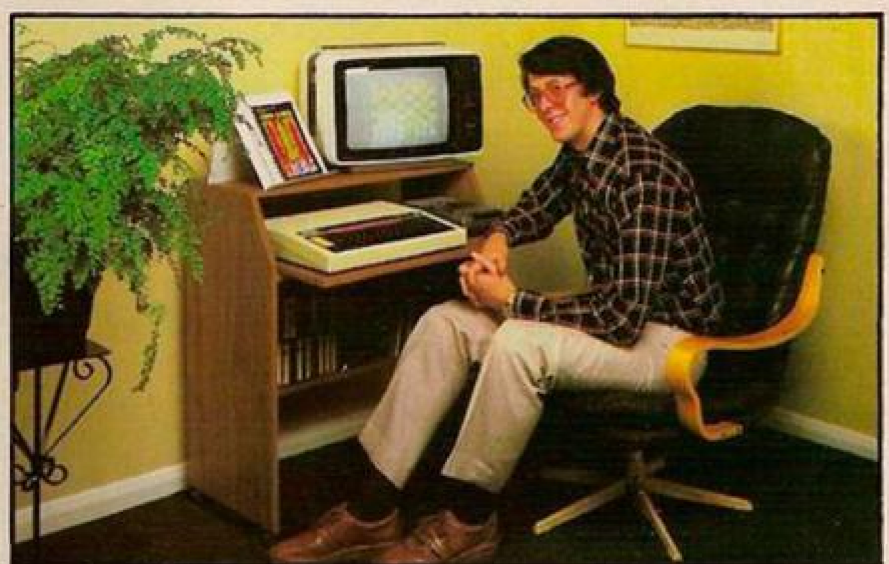
```
5CD0 3E01       LD   A,01
5CD2 CD9B22     CALL 229B
5CD5 FD36530F   LD   (IY+53),0F
5CD9 3E02       LD   A,02
5CDB CD0116     CALL 1601
5CDE CD6B0D     CALL 0D6B
5CE1 3E02       LD   A,02
5CE3 CD0116     CALL 1601
5CE6 PRINT "FN█ $()██NO.()█NO.█
(WORD) NO."
5D47 060E       LD   B,0E
5D49 3E02       LD   A,02
5D4B 21005B     LD   HL,5B00
5D4E 77         LD   (HL),A
5D4F 23         INC  HL
5D50 10FC       DJNZ 5D4E
5D52 0606       LD   B,06
5D54 AF         XOR  A
5D55 21035B     LD   HL,5B03
5D58 77         LD   (HL),A
5D59 23         INC  HL
5D5A 23         INC  HL
5D5B C604       ADD  A,04
5D5D 10F9       DJNZ 5D58
5D5F 2A4B5C     LD   HL,(5C4B)
5D62 22B05C     LD   (5CB0),HL
5D65 11025B     LD   DE,5B02
5D68 7E         LD   A,(HL)
5D69 FE80       CP   80
5D6B C8         RET  Z
5D6C E6E0       AND  E0
5D6E FEE0       CP   E0
5D70 281E       JR   Z,5D90
5D72 13         INC  DE
5D73 13         INC  DE
5D74 FEC0       CP   C0
5D76 2818       JR   Z,5D90
5D78 13         INC  DE
5D79 13         INC  DE
5D7A FE40       CP   40
5D7C 2812       JR   Z,5D90
5D7E 13         INC  DE
5D7F 13         INC  DE
5D80 FE80       CP   80
5D82 280C       JR   Z,5D90
5D84 13         INC  DE
5D85 13         INC  DE
5D86 FE60       CP   60
5D88 2806       JR   Z,5D90
5D8A 13         INC  DE
5D8B 13         INC  DE
5D8C 1802       JR   5D90
5D8E 1802       JR   5D62
5D90 ED53005B   LD   (5B00),DE
5D94 1A         LD   A,(DE)
5D95 FE18       CP   18
5D97 2026       JR   NZ,5DBF
5D99 E5         PUSH HL
5D9A D5         PUSH DE
5D9B 76         HALT
5D9C FDCB016E   BIT  5,(IY+01)
5DA0 28F9       JR   Z,5D9B
5DA2 FDCB01AE   RES  5,(IY+01)
5DA6 0618       LD   B,18
5DA8 CD000E     CALL 0E00
5DAB 0606       LD   B,06
5DAD 21025B     LD   HL,5B02
5DB0 35         DEC  HL
5DB1 7E         LD   A,(HL)
5DB2 FE01       CP   01
5DB4 2001       JR   NZ,5DB7
5DB6 34         INC  (HL)
5DB7 23         INC  HL
5DB8 23         INC  HL
5DB9 10F5       DJNZ 5DB0
5DBB D1         POP  DE
5DBC E1         POP  HL
5DBD 18D1       JR   5D90
5DBF 7E         LD   A,(HL)
5DC0 E61F       AND  1F
5DC2 C660       ADD  A,60
5DC4 F5         PUSH AF
5DC5 3E02       LD   A,02
5DC7 CD0116     CALL 1601
5DCA 3E16       LD   A,16
5DCC D7         RST  10
5DCD 2A005B     LD   HL,(5B00)
5DD0 7E         LD   A,(HL)
5DD1 34         INC  (HL)
5DD2 D7         RST  10
5DD3 23         INC  HL
5DD4 7E         LD   A,(HL)
5DD5 D7         RST  10
5DD6 F1         POP  HL
5DD7 D7         RST  10
5DD8 2AB05C     LD   HL,(5CB0)
5DDB CB6E       BIT  5,(HL)
5DDD 2008       JR   NZ,5DE7
5DDF 23         INC  HL
5DE0 5E         LD   E,(HL)
5DE1 23         INC  HL
5DE2 56         LD   D,(HL)
5DE3 19         ADD  HL,DE
5DE4 23         INC  HL
5DE5 18A7       JR   5D8E
5DE7 CB76       BIT  6,(HL)
5DE9 2012       JR   NZ,5DFD
5DEB 23         INC  HL
5DEC 7E         LD   A,(HL)
5DED CB7F       BIT  7,A
5DEF 2003       JR   NZ,5DF4
5DF1 D7         RST  10
5DF2 18F7       JR   5DEB
5DF4 E67F       AND  7F
5DF6 D7         RST  10
5DF7 110600     LD   DE,0006
5DFA 19         ADD  HL,DE
5DFB 1891       JR   5D8E
5DFD CB7E       BIT  7,(HL)
5DFF 28F6       JR   Z,5DF7
5E01 111300     LD   DE,0013
5E04 19         ADD  HL,DE
5E05 1887       JR   5D8E
```

THE IDEAL HOME FOR YOUR HOME COMPUTER



The System Care Desk - made specially for home computer systems. Designed as a neat, smart piece of furniture for your home.

£49·95



Exhibited at the P.C.W. Show and the Northern Computer Fair

And now including design features based on our discussions with home computer users. Send for yours TODAY.

- Supplied as a flat-pack. Easily assembled. Full instructions provided.
- Smart teak effect finish.
- All cables can be neatly and safely 'hidden.'
- Ergonomically designed. Sliding shelf positions the keyboard at the right distance from the screen to suit you. Slides away after use. Saves space.
- Easi-glide castors allow you to move your computer installation where you want it.
- Houses computer, disk drive / cassette recorder and monitor, with ample space for tapes, books etc.
Overall height - 0.83m.
Computer shelf height - 0.70m.
Width - 0.70m.
Depth (with shelf closed) - 0.38m.

system care
At home with your computer.

***NOW* AVAILABLE TO YOU BY MAIL ORDER DIRECT FROM THE SUPPLIER.**

Micro Aids, 2 Boston Close, Culcheth, Warrington, WA3 1BR

4-WAY MINIATURE MASTER PLUG



Provides you with just one 13 amp mains input for up to four 6 amp max outputs to a total loading of 13 amp. Tidy. Safe. Fully insulated.

£8·95

(Only available with orders for the System Care Home Computer Desk).

ORDER BY FREEPOST - send the coupon or order in writing along with your cheque or postal order in an envelope - no stamp needed. Please allow up to 28 days for delivery. And there's a 14-day money back option, in the event that you're not fully satisfied with your purchases.

FREE

A pack of cable tidies with every desk ordered. To ensure safe operation and improve appearance.

To: Micro Aids, FREEPOST, 2 Boston Close, Culcheth, Warrington, WA3 1BR

ORDER

QTY	ITEM	ITEM PRICE	TOTAL
______	System Care Desk	£49.95	______
______	4-Way Master Plug	£8.95	______
		Post / Pkg	£4.95

I enclose a cheque/postal* order payable to Micro Aids for £ ☐

* Please delete as applicable.

Signature ______

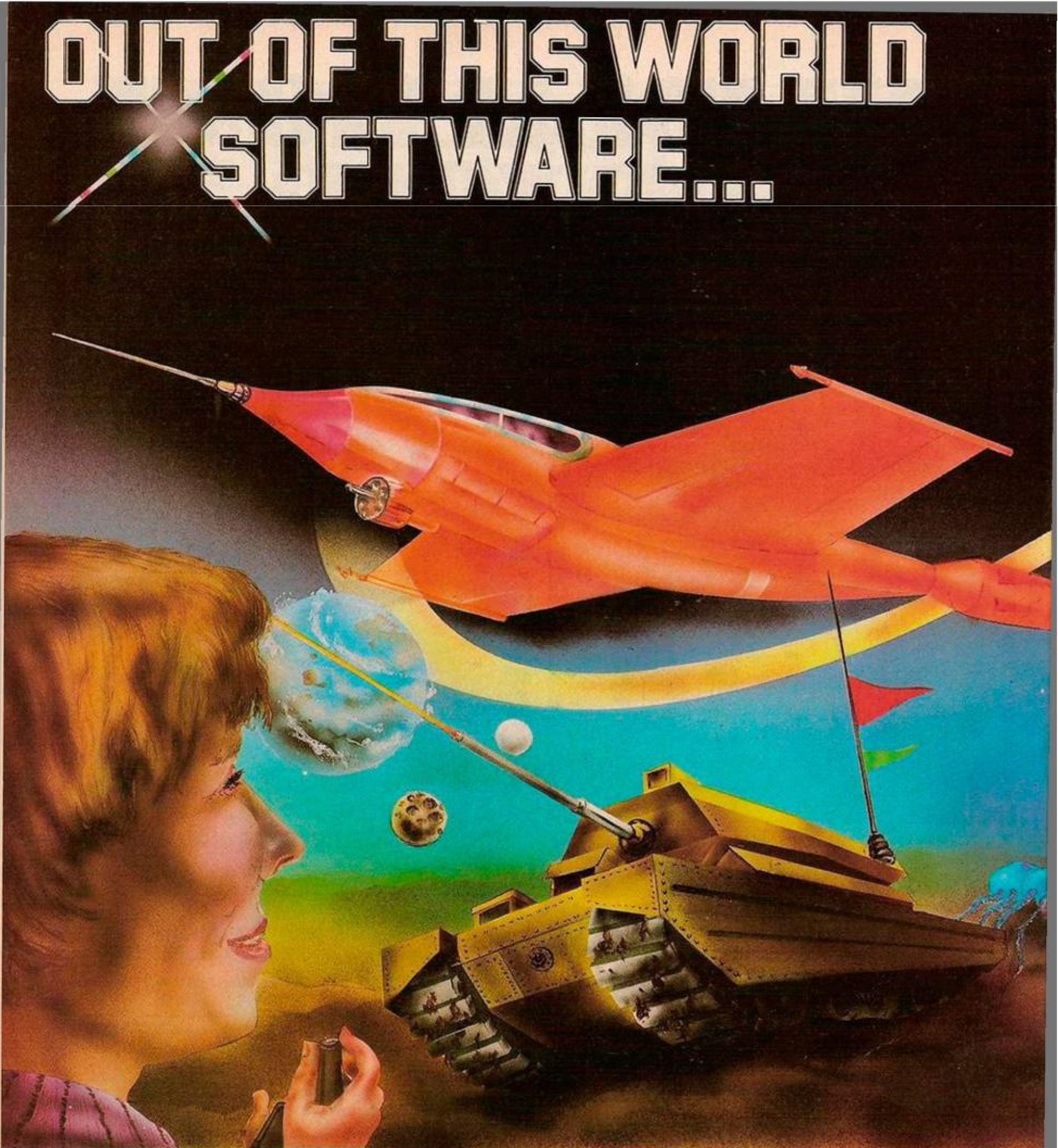
PLEASE PRINT

Name: Mr/Mrs/Miss: ______

Address ______

______ Tel: ______

FREEPOST - no stamp needed. Prices apply to U.K. only. Export prices on application.



PLEASE SEND ME .... @ £ ....

PLEASE SEND ME .... @ £ ....

PLEASE SEND ME .... @ £ ....

PLEASE ADD ON 50P FOR P/P

I ENCLOSE CHEQUE/P.O. PAYABLE TO dk tronics

TOTAL .... OR DEBIT MY ACCESS/BARCLAYCARD

NAME ....

ADDRESS ....

....

SIGNATURE ....

3D TANX £4.95 This a totally new and unique game, never bef have such graphics been seen on the Spectrum. Pit your wits aga the enemy Tanx. This is a full feature game with fantastic 3D balis We believe that this game has no equal. Fantastic sounds and co

CENTIPEDE £4.95 One of the most addictive games for the Spectrum. The centipede increases in length as the spider become increasing menance. As you shoot off the segments, the centiped spilts up and moves at accelerated speed up, down, left, right. Fu sound effects and colour.

DICTATOR £4.95 Will you be able to manipulate the squabblin population, stay in favour with the powerful secret policy and m the right decisions to keep control of your volatile subjects? A co and entertaining simulation adventure featuring easy operation a excellent use of graphics, colour, and sound effects.

ZXED (TOOLKIT) £6.95 Zxed is a powerful editor for use on t 16K or 48K Spectrum, intended for use by the serious basic programmer, and offers several useful and time-saving features. Features provided are as follows: ALTER, BYTES, COPY, DELETE, HELP, LINE, MOVE, RENUMBER, AUTOLINE, RENUMBERER, and VERIFY. These will help you during all stages of program development.



3D SPAWN OF EVIL £4.95 Deep into the galactic void, hosts of alien spawn go through a complex multi-stage breeding cycle. Your task is to seek out and smash the cycle to eliminate the spawn before it matures to full attack potential. This is the most spectacular 3D space game ever written for this 16K Spectrum.

METEOROIDS £4.95 The best Spectrum version of this popular arcade game. Three meteor types which increase and decrease in frequency. The meteros shatter into many fragments and the fragments even splatter. Ship drift and decelerate, space walk, and evil alien ship. This game also contains two character sets.

SOUND FX £4.95 Released by popular demand, this is the program that was used to create most of the sound effects featured in our game. It enables you to create an infinitely variable amount of machine code sounds, and use them in your own basic programs. Even the beginner can use this program to create fantastic sounds for his own programs.

DISASSEMBLER £4.95 This is a fast machine code disassembler for use on the 48K and 16K Spectrum. It gives full colour output to the screen, grouping together similar instructions in the same colour, IE: all loading instructions are green. You have options for output into the screen or printer, this output be in decimal or hex.

FRUIT MACHINE £4.95 An excellent new program from d'k tronics, with such features as: nudge, hold, gamble. Superb use of graphics and colour; just like the real thing, and just as addictive!

FROM

d'k'tronics

CREDIT CARD SALES LINE (0799) 22359/26350 (24 hrs).

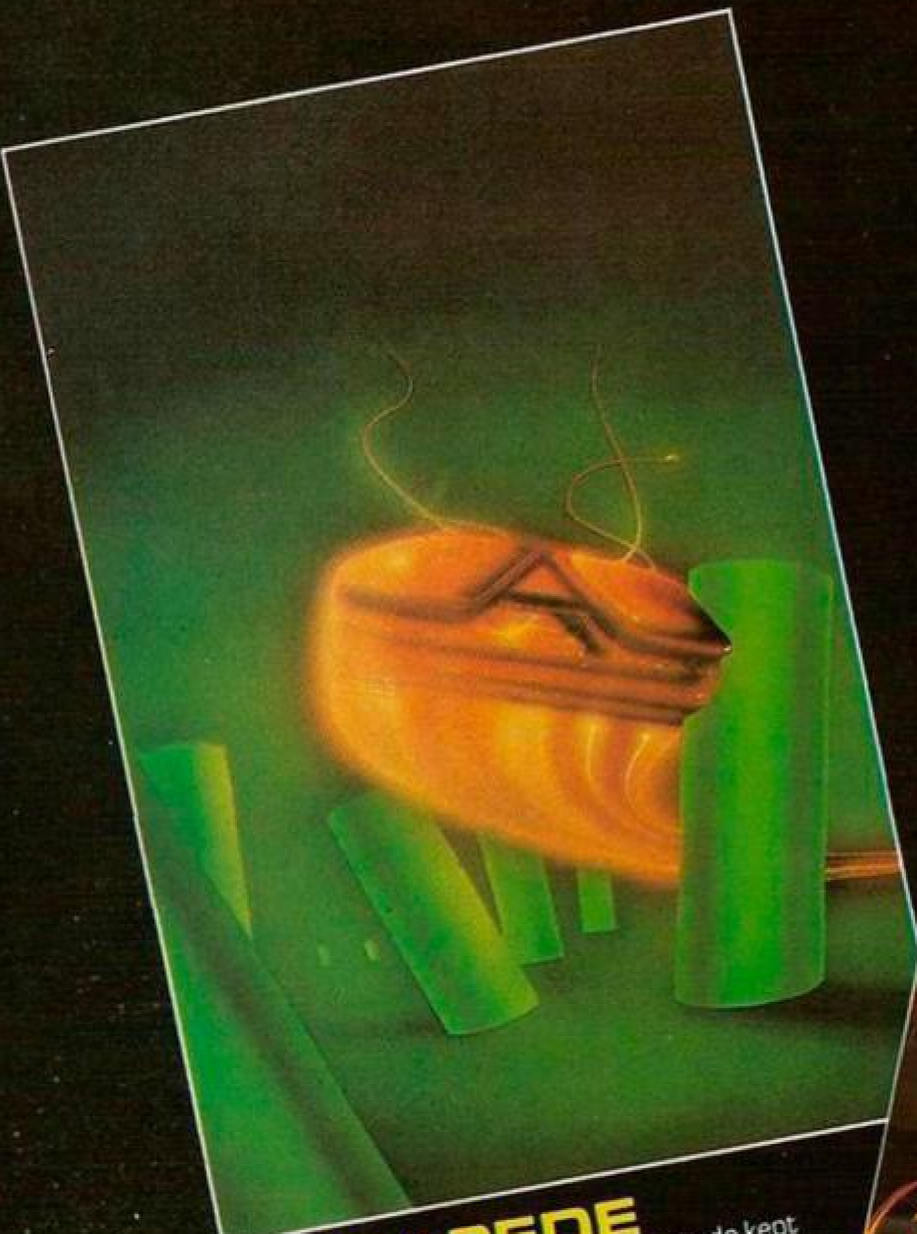
QUOTING YOUR ACCESS OR BARCLAYCARD NUMBER d'k tronics, Unit 2, Shire hill Ind. Est., Saffron Walden, Essex. CB11 3AQ.

d'k tronics Software is also available from Boots, WH Smiths and all good Software outlets.

SOFTEK

SOFTWARE

Invading your space NOW!



MEGAPEDE

No matter how fast I fired, the Megapede kept on coming! I was gaining ground, though, when suddenly the Spider appeared on collision course zero! Turn–dodge–I out-manoeuvred, I blasted him. But just then Scorpi appeared dropping her indestructible fleas...
Nine levels of play plus high score 100% machine code. Full colour and sensational sounds. Rated by T.V. Choice as "a superb rendering of the popular arcade game".
Realisation: Andrew Beale.

MONSTERS IN HELL

It was like a nightmare... trapped in a Hellish scene... chased through a maze of platforms and ladders by Vampire Monsters. But I had my Magic Hammer, and The Power was on my side. The Monsters were falling at my feet! When suddenly the Mad Monk sent forth his ghouls...
Amazingly amazing addictive game, in super-fast machine code, with full colour graphics and superb sound.
Realisation: Martin Lewis.



Just two of Softek's amazing range of software for the ZX Spectrum.

£5.95

each including VAT and perpetual guarantee; 16K or 48K Spectrum.

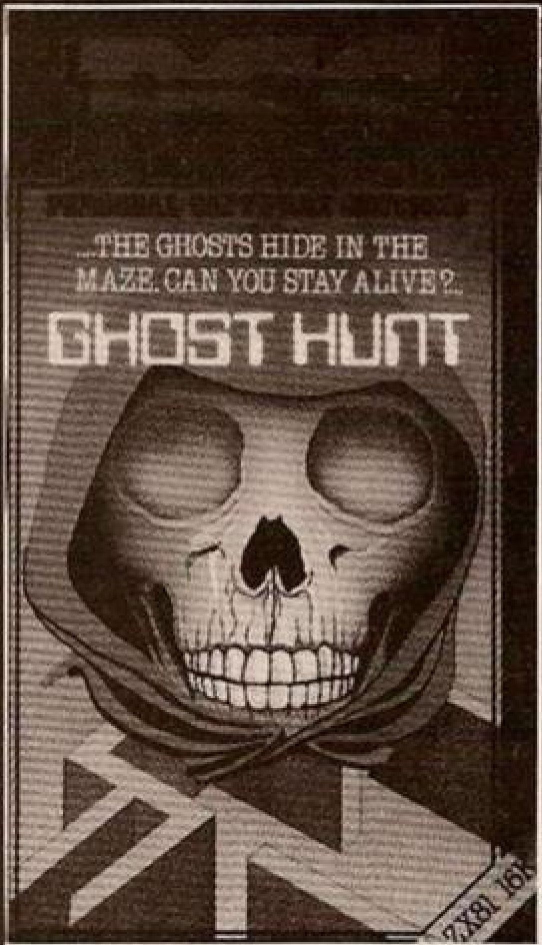
Get them now from W.H. Smith and look out for them in such stores as Boots, Menzies, Currys, and all fine softsellers throughout Britain.
Dealer enquiries: contact Tim Langdell

SOFTEK SOFTWARE 329 CROXTED ROAD LONDON SE24



Everyone Needs Space to Play
SOFTEK
SCORE 08000
ZX SPECTRUM
PERPETUAL

the ZX81 16K and Spectrum

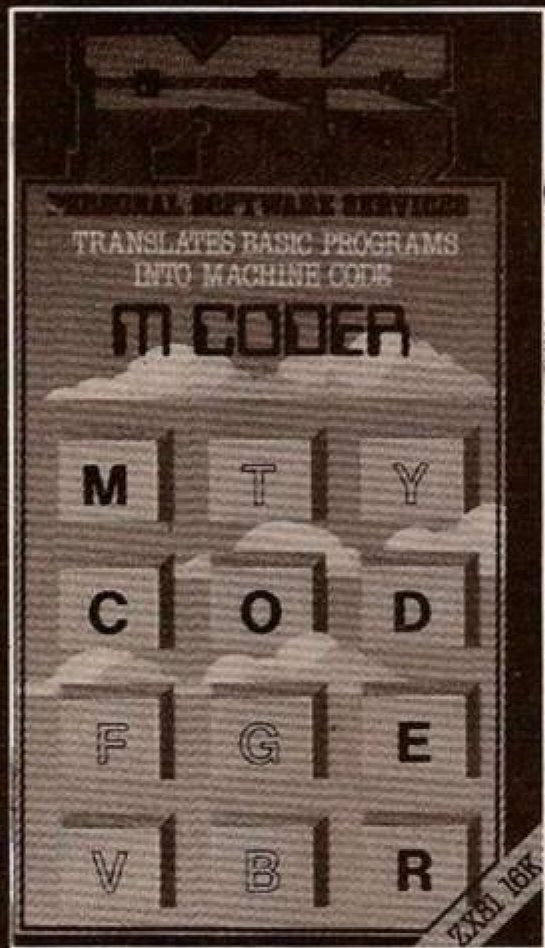


Ghost Hunt

Gobble your way through a maze – Ghosts, power pills etc. All machine code. Super fast action.

SPECTRUM 16-48k £4·95
ZX81 16K £3·95

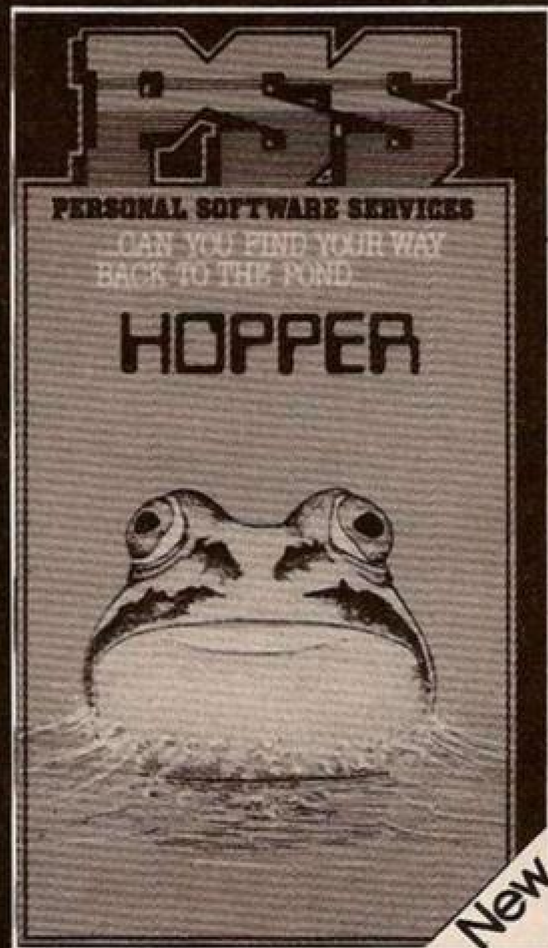




MCoder

Quite simply the most flexible integer compiler available today for either the 16K ZX81 or the Spectrum 16K/48K. M Coder will translate 95% of all non-string basic. The ZX81 version is just over 2K, The Spectrum version just over 3K.
Simply load MCoder, load your basic program or type one, use a print USR command and watch your program being compiled into super fast machine code.

SPECTRUM 16K-48K £8·95
ZX81 16K £7·95



Hopper

Can you help Fergy and his friends get across the 4 lane high way and back to the lilly pond? Includes crocodiles, logs, varying speed traffic etc.

ZX81 16K £3·95

PSS
PERSONAL SOFTWARE SERVICES

SEND CHEQUE OR PO TO
PSS 452 STONEY STANTON ROAD
COVENTRY CV6 5DG

Available from all good Computer Stores or by Mail Order

COMPETITION-PRO JOYSTICK

PRECISION GAME CONTROL!



Outstanding Features

- Self centreing stick
- Super strong nylon and steel construction
- A total of 8 directions *plus* 2 large fire buttons (for left or right handed operation)
- Arcade proven moulded leaf switches ensure incredible reliability
- Complete with boxed interface on Spectrum models
- A wide range of Joystick compatible software readily available from W H Smith and leading computer shops or direct from us

I wish to order:	Item		Amount
Hardware			
□ Spectrum Joystick		@ £25.00	
□ VIC 20 Joystick		@ £16.50	
□ Atari 400/800 Joystick		@ £16.50	
Software			
□ Slippery Sid	16K Spectrum Silversoft	@ £5.95	
□ Cyber Rats	16/48K Spectrum Silversoft	@ £5.95	
□ Night Flite	16/48K Spectrum Hewson Cons.	@ £5.95	
□ 3D Tunnel	16/48K Spectrum New Gen	@ £5.95	
□ Gulpman	16K Spectrum Campbell Systems	@ £5.95	
□ Time Gate	48K Spectrum Quicksilva	@ £6.95	
□ Meteroids	16K Spectrum Softek	@ £4.95	
□ Spooky Man	16K Spectrum Abbex	@ £4.95	
□ Galaxians	16K Spectrum Artic	@ £5.95	
Please tick appropriate boxes Please add £1.00 P&P on hardware		Post & Package	
Software post FREE		Total (VAT inclusive)	

Cheques/postal orders should be made payable to Kempston (Micro) Electronics Ltd
For Access/Barclaycard please give your card number and signature

Card No ____________________

Signature ____________________

Address ____________________

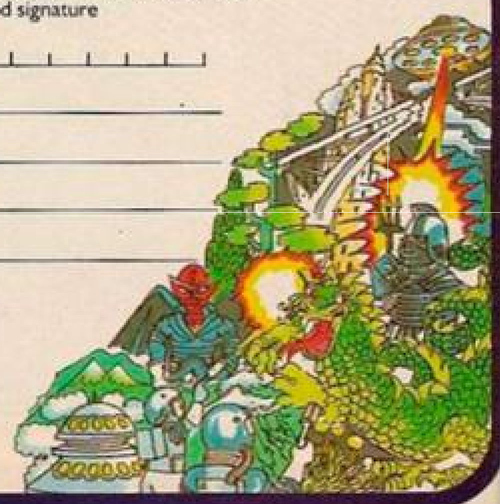
____

____

Please post to Kempston (Micro) Electronics, Dept
180a Bedford Road, Kempston, Bedford, MK42 8BL

SOLE UK DISTRIBUTOR

KEMPSTON
MICRO ELECTRONICS



BASIC DICTIONARY

This dictionary, compiled by Tony Edwards, will explain the function of common Basic words as used in popular machines, enabling you to work out your own machine's equivalent. A useful complement to our recent series on Basic dialect translation.

BASIC DICTIONARY

@ **(at)** Used as an abbreviation for AT. On some computers

<shift> @

will freeze execution until another key is pressed.

\# **(hash)** Used as a flag to indicate double precision variables. The BBC Micro uses the hash sign to indicate an immediate operation in assembler. This sign is also used with the meaning "number" when referring to peripherals.

CLOAD # 1

will load from peripheral device number 1. Also used to represent "not equal to".

$ **(dollar)** An ANSI standard symbol indicating string variable. It is often used to indicate string functions also.

! **(exclamation mark)** Used as a flag to indicate single precision variables. Its use is usually optional as variables default to single precision. Some interpreters use the exclamation mark as an abbreviation for Remark.

% **(per cent)** A flag used to indicate integer variables. It is also used in connection with a Print Using statement to indicate the output is unprintable.

? **(question)** A common abbreviation for PRINT.

/ **(back slash)** An operator used to allow multiple statements on a single line. It is also used as an erase indicator when correcting typing errors.

* **(asterisk)** An alternative for the multiplication operator. It is also used on some computers as the logical AND operator. The BBC Micro uses it to express the binary multiplication of integers and reals.

** **(double asterisk)** An alternative for the exponentiation operator.

(circumflex) An exponentiation operator

\+ **(plus)** The arithmetical addition operator. Some computers use this symbol in place of the logical OR so care must be exercised with such statements as "IF (A=0) + (B=0)" which will be satisfied if either A or B is equal to 0.

BASIC DICTION

This symbol is also used to indicate concatenation of strings.

\- **(minus)** The arithmetic subtraction operator, also used as a negation operator.

/ **(slash)** The ANSI standard division operator.

& **(ampersand)** Widely used as a suffix to indicate hexadecimal numerals.

~ **(tilde)** Used on the BBC Micro at the start of a print field indicating that the item is to be printed in hexadecimal.

£ **(pound)** Not usually available, but when it occurs it often replaces the $ and is used in the same way.

↓ **(down arrow)** Represents a line feed.

→ **(right arrow)** Moves cursor right.

← **(left arrow)** Moves cursor left. Also known as "Back arrow".

< shift > ←

Deletes the current line on some machines.

π **(pi)** A function which returns the value of PI.

TOWER OF BABEL

Computers do not share a common tongue, because some languages must be task-specific. John Dawson traces their development.



HAVING TRACED some of the history of software from the first faltering machine-code steps in Manchester and Cambridge through the development of Fortran and Forth, this month we look at how information may be regarded as an asset to be examined and manipulated in many ways, rather than as data simply to be fed through a program in order to achieve a pre-ordained printout.

Language tree

First, look at figure 1 and you will see the rough historical order in which high-level languages arose and how the "original" high-level languages have bred their offspring. There are hundreds of computer languages and figure 1 shows only a very few of the more common. Fortran was written for solving scientific problems while Cobol — Common Business-Oriented Language — was commissioned by the Department of Defense in the United States for general "commercial" use. Between them, these two languages are probably used in the great majority of the world's professional computing applications.

How can that be so? There are more sophisticated languages available that are easier for the programmer to use and software development has moved on considerably from the late 1950s when they were first made available commercially. Many professional computing personnel still use Cobol as the language of choice on new hardware. Why? The answer is simple — Cobol and Fortran work, they are well-understood and that makes the task of developing a program or a suite of programs far easier than it would be if an untried language was introduced. Additionally, there are large numbers of sub-routines and larger segments of programs that can be incorporated into a new piece of software.

The person who taught me anaesthetics said that "a crisis is no time to use a new technique that is unfamiliar. Stick to something ordinary that you understand well". Most software development turns into a crisis at some stage.

At the same time there is no doubt that Fortran is a pretty revolting language to use. "Structured" programming is nearly impossible using Fortran and one of the major advances in the development of programming languages has been the gradual acceptance of the idea that structure makes programs easier to read, hence less prone to error, and, most important, allowing the programmer a less constrained expression of the steps to the solution of the problem. A program built out of a number of modules will be comparatively easy to debug and can be produced by a team of programmers working to some common standards.

Easy debugging

Modules can be built very easily so that there is a single entry point and a single exit. Once again debugging becomes far easier. Forth allows program development by writing and testing the action of discrete words — modularity carried to a useful and logical conclusion. The Goto instruction, a natural development of the first machine-code programs which would go to one instruction or another depending on the result of a test, permits crossed lines of flow in a program, several entry points into a block of code and many exits. The Goto or Jump instruction is intuitively attractive and potentially highly confusing.

Many modern languages have no Goto instructions relying instead on loops controlled by Do — Until or Repeat — While operations to create structure in the program.

Computer languages can be classified in a number of ways. There are fine differences between some versions of a language and, like human speech, there are the identifiable characteristics that allow some languages to be grouped into families. After the loose "commercial" versus "scientific" distinction

epitomised by Fortran and Cobol, there is a split between interactive and batch-processing languages. An interactive computer language provides facilities that allow the programmer to make changes in the program almost as it is executing. The ordinary interpreted Basic supplied with almost every microcomputer is an interactive language. A batch-processing language makes no provision for the operator to modify the program at the computer.

I remember going to a hut behind University College in the late 1960s, sitting at a large card punch to produce a set of cards holding a Fortran program and then handing the cards across a counter in the computer department. The cards also made splendidly original party invitations with a small line of type at the top and coded holes all over the rest of the card. However, it was 24 hours later before I was able to return to collect the results of my program execution.

Fortran has now been implemented, that is installed and made to work on a number of microcomputers and has become more interactive. It is still a compiled language, which means that you must first write the source code, then compile that to object code — machine-code instructions that will execute on your machine — and finally you can run the object code to carry out the operations you wish. If an error occurs you must load the source code back into your computer, find and correct the error and start the process all over again.

Functional languages

Lisp and Prolog are examples of a group of computer languages which are known as functional languages. The other languages shown in figure 1 are "imperative" languages. A program written in an imperative language is composed of a series of statements which are obeyed by the computer. Certainly the machine may choose one of two or more conditional branches from time to time but the program is carefully prepared to take account of those possibilities. In other words, the programmer must describe quite precisely how a result is to be computed, rather than concentrating on the result itself. Functional languages work fundamentally by evluating a function and the general form of a program is:

Results = Function (input values)

For example, a question in Prolog is a program. At a very simple level a Prolog programmer might write:

Which (x x sex Male and x illness Glandular Fever)

which might produce this on the screen of the computer:

Answer is (Bertram Leadston)
Answer is (John Salmon)
Answer is (Nigel Mudthorpe)
No (more) answers

if the information had been entered, probably among a lot of other data, under the headings of "name", "sex" and "illness". In relation to the general form of the program. 'Which' is the function to be carried out and the items in the brackets are the input values.

Snobol is an example of a Markov language: that is a language in which the basic operation is to look for a pattern, substitute something in its place and choose the next statement to be carried out on the basis of the match between the two patterns. A Markov statement is said to be a random process in which the probability of a transition to a new state depends only on the current state. D W Barron says in *An Introduction to the Study of Programming Languages* that it is arguable that all algorithms — the sequence of operations necessary to solve a problem — can be reduced ultimately to Markov statements. Snobol 4 is a versatile string-processing language which can be used for text manipulation. You could, for example, look for a match in Snobol by typing the following statements:

```
STRING "John Dawson" :
S (PRINTOUT) F
(TRYAGAIN)
```

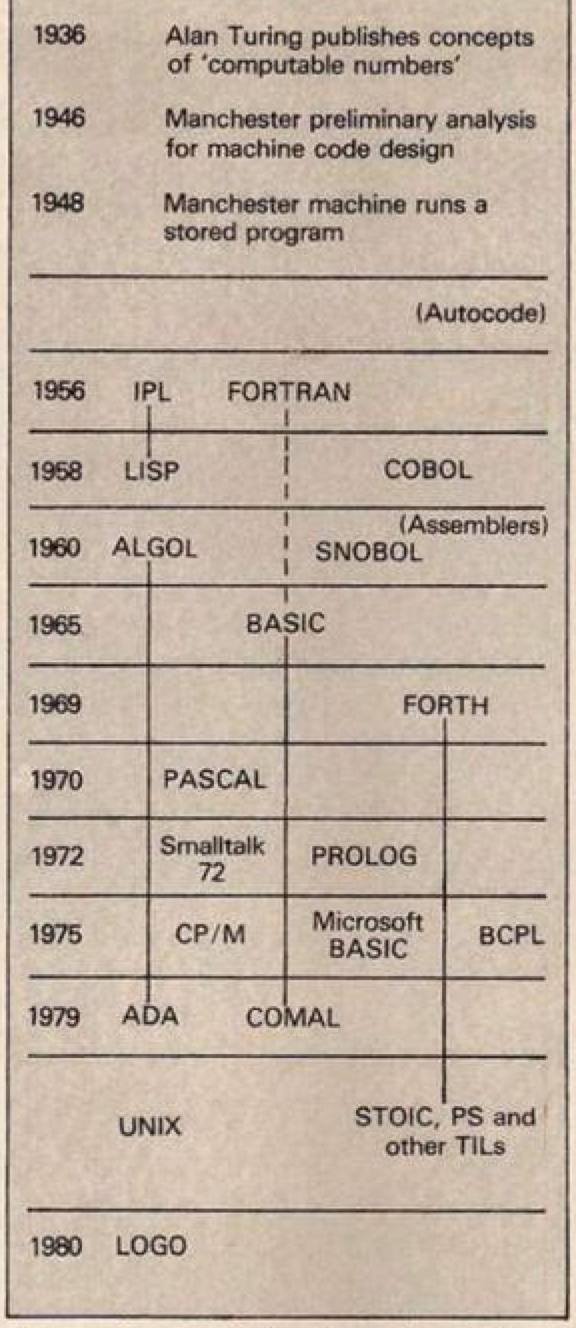


Figure 1. The language tree.

Data protection

If the words "John Dawson" appear in the characters which make up String — a Successful match — the program will branch to the label Printout. If the match Fails — F — then control will pass to the section of the program labelled Tryagain. There are many other sophisticated search and manipulation instructions in this language and Snobol may be one of the computer languages which could be used in computer applications that particularly worried the Lindop Committee on Data Protection because of the possibility of free text retrieval from very large computer files held about individuals.

The fourth loose distinction between types of computer languages differentiates between ordinary programs such as Basic and Pascal, and real-time computer languages for controlling a process as it occurs.

The hallmark of a real-time language is its ability to respond to external interruptions as peripheral devices generate information that must be taken into consideration by the program.

Because "bit-twiddling" and interrupt handling are difficult to achieve at a high level, most real-time languages tend to work in an intimate relationship with the machine's operating system. Forth, Stoic and the other Threaded Interpretative Languages are able to drop directly into low-level, and hence fast and finely controllable, assembly language which indicates that it should be simpler to try to create a real-time program in Forth than in Basic, Pascal or Fortran.

An aircraft simulator is a good example of an application that may require real-time computing, taking in the responses made by the pilot through the cockpit controls, processing that information, and then changing the attitude, speed and other simulator outputs to match the real aircraft's characteristics.

Sieve race

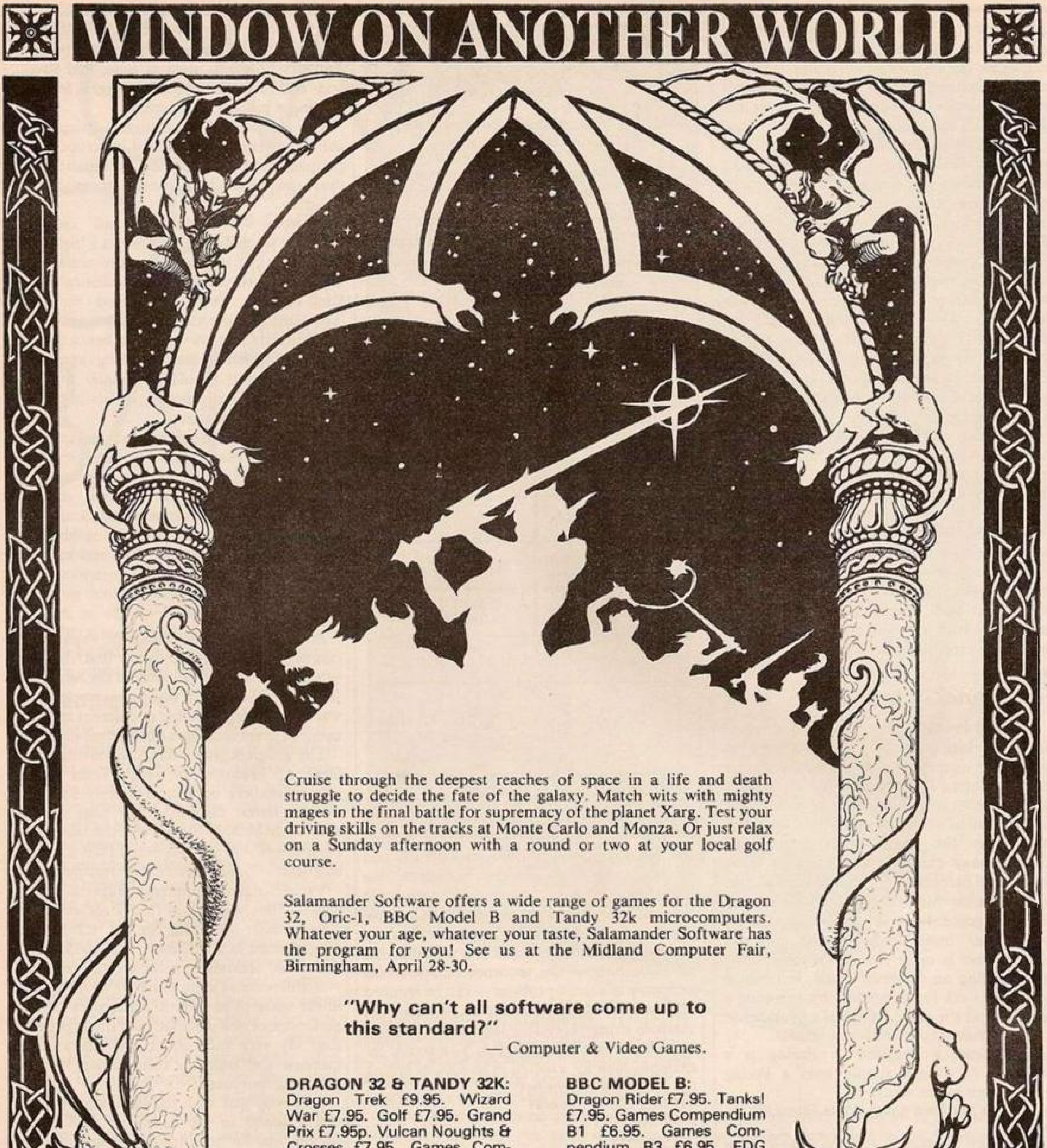
After all the esoteric discussion about which language suits which purpose best there are some simple stark facts based on the results of a January 1983 survey in which the same program was run on a large number of different machines using different languages on different machines.

The program was a standard version of the Sieve of Erastothenes which finds all the prime numbers between 3 and 16,381. The world's fastest computer, the Cray 1, vied with an IBM 3033 for the shortest time using Fortran — 0.110 seconds — and IBM assembly language — 0.0078 seconds — respectively.

Various microcomputers competed for the slowest time which was finally achieved by a Xerox 820 operating under CP/M and programmed in RMCobol. This combination took 5740 seconds to complete the same task — a difference of approximately 700,000 times in the speed of execution. Remember that the performance of a machine on a single program may say very little about the utility of the machine and language combination for your particular purposes.

However, that said, the fascinating statistic that I found in the listing of performance figures was for the Apple II computer programmed in Fortran. One version of Fortran running on the original 6502 central processor unit took 333 seconds to find all the expected prime numbers.

A second version of Fortran which operated under CP/M using a plug-in Microsoft card took only 34 seconds, about one tenth of the time. That difference cannot be explained by variation in the clock rates allowing one processor to run faster than another, nor can the physical construction of the machine play any significant part. The only possible explanation is that the version of Fortran running under CP/M is vastly more efficient than the other for this purpose — a better implementation of the language. ■


WINDOW ON ANOTHER WORLD
Cruise through the deepest reaches of space in a life and death struggle to decide the fate of the galaxy. Match wits with mighty mages in the final battle for supremacy of the planet Xarg. Test your driving skills on the tracks at Monte Carlo and Monza. Or just relax on a Sunday afternoon with a round or two at your local golf course.
Salamander Software offers a wide range of games for the Dragon 32, Oric-1, BBC Model B and Tandy 32k microcomputers. Whatever your age, whatever your taste, Salamander Software has the program for you! See us at the Midland Computer Fair, Birmingham, April 28-30.
"Why can't all software come up to this standard?"
— Computer & Video Games.
DRAGON 32 & TANDY 32K:
Dragon Trek £9.95. Wizard War £7.95. Golf £7.95. Grand Prix £7.95p. Vulcan Noughts & Crosses £7.95. Games Compendium D1 £7.95.
BBC MODEL B:
Dragon Rider £7.95. Tanks! £7.95. Games Compendium B1 £6.95. Games Compendium B3 £6.95. EDG Graphics Package £24.95.
ORIC-1: Trek £9.95. Games Compendium 01 £7.95.
PLEASE ADD 50p P&P TO ALL ORDERS.
Cheques or postal orders payable to:—
SALAMANDER SOFTWARE, Dept B, 27 Ditchling Rise, Brighton, East Sussex. BN1 4QL. Tel: 0273 771942.
Programmers wanted: good royalties paid!
Salamander Software

spectrum

NEWS from SPECTRUM

BBC

Now from **SPECTRUM** the outstanding **BBC 'B'** machine plus, Disk Drives & software see ad. opposite for details.

ATARI 800

This **proven and tested** micro is now **UPGRADED TO 48K RAM** and there's **no increase in price either** which must, make it **about the best value around.** See our ad. for further details.

VISCOUNT DISK DRIVES

Coming soon! a fabulous new range of Disk Drives specially selected by **SPECTRUM** from under **£200** too! suitable for most micros inc. LYNX, COL. GENIE, DRAGON etc Ask your local **SPECTRUM** dealer for further details.

NEW SPECTRUM MEMBERS

Check our address page! - there are many new **SPECTRUM** dealers throughout the UK so there's a good chance there'll be a **SPECTRUM** centre near you.

INTRODUCING SPECTRUM FACTS!

Next to many of our offers, you'll find a few lines tagged **SPECTRUM FACTS.** We pride ourselves on providing you, the customer, with a **genuine service** as well as **super LOW prices,** and we want you to know that when you buy from a **SPECTRUM** dealer, you'll get **exactly the right micro for your needs. SO LOOK OUT FOR YOUR SPECTRUM FACTS!**

AFTER SALES CARE

SPECTRUM service centres will ensure that should your machine 'go down' **we will get it running again as quickly as possible.** We also offer **extended warranties** at reasonable prices too! - ask your **SPECTRUM HOME COMPUTER CENTRE** for full details.

COMPUTER DEALERS

(or prospective Computer dealers!) If you would like to know more about becoming a **SPECTRUM APPOINTED DEALER** on an exclusive area basis, please write to **MIKE STERN, Spectrum (UK) Ltd., Burrowfield, Welwyn Garden City, Herts.**

Now from your local Spectrum dealer - the famous

BBC Model 'B' MICRO



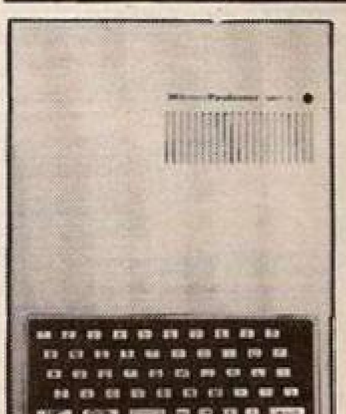
Yes, this **top selling Micro system** is now available from your local **SPECTRUM** dealer -the **BBC Model'B'** offering **32K RAM** plus a **full back-up of peripherals & software** too! It's an **infinitely expandable** machine, ideal for the **home or business** and is already widely used for **educational purposes in schools** -so the chances are **your** children may already be **well familiar with its operation,** which must make it the **ideal choice** for the **home** too! So if you're thinking of buying a micro you **must** take a look at the **BBC** at your local **SPECTRUM** dealer **NOW!** - but just one word of warning, initially stocks will be limited and **demand is bound to be great,** so please 'phone to check the stock position before making a journey.

BBC 'B' with Disk Interface	£470.50
BBC Disk Interface Kit	£95.00
BBC Single Disk Drive 100K	£265.00
BBC Dual Disk Drive 800K	£803.85
BBC Tape Recorder	£29.90
BBC Acorn Software Cassette based from	£9.95
BBC Disk based software	£11.50

Spectrum LOW Price £399.00 INC. VAT

BBC Peripherals & software in short supply - Please telephone before making a journey

MICRO PROFESSOR



Another **super new** machine from the east - the **superb MICRO PROFESSOR MPF-11.** An **extremely versatile** personal computer with **Apple compatability 64K RAM & 16K ROM** (includes 12K for BASIC) **6 Colours & full sound** and can run on **most existing Apple software.** For **Home, Business, Education** or **Games** use - it's **unbeatable value!** So if you've always wanted an Apple but couldn't afford one take a look at the **MICRO PROFESSOR** at **SPECTRUM NOW!** it's **incredible value for money.**

Spectrum LOW Price £269.00 Inc. VAT

Optional full size 55 key, keyboard **£36.25**
Joysticks **£14.95**
Wide range of software available

ORIC-1



A superbly designed and engineered micro and great value-for-money from **SPECTRUM.** Offering **48K RAM Colour** - (8 foreground and 8 background can be displayed at same time) **High resolution graphics User definable Graphics. Full sound** (6 octaves of controllable sound) **Easy to use keyboard with moving keys. Standard Centronics parallel interface allows** easy connection to a wide range of printers etc

Spectrum LOW Price £169.95 Inc. VAT

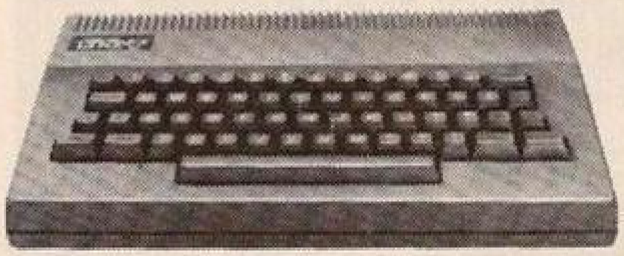
SPECTRUM FACTS

Maximum user RAM	47,870 Bytes
Text screen	28x40
High Resolution	240x200
Cassette Lead	Included

Not all stores carry every advertised item, please phone before making a journey — Prices correct at time of going to press E. & O.E.

The powerful and infinitely expandable

LYNX



Just look at this **super new LYNX Micro - an incredible** 16K & 32K video ram and that's expandable up to or beyond 96K. For just **£225.00 INCLUDING VAT** the **LYNX is exceptionally versatile.** All **LYNX's** 'add-on' connections are **standard types.** The high definition **colour graphics** make it a **top value choice** for the **home or office** (with expansion, the **LYNX** can become an 80 characters-per-line word processor!) Take a look at the **LYNX** - a memorable bargain from **SPECTRUM.** But please phone to check stock position before making a journey as this machine is bound to be in **great demand.**

Spectrum LOW Price

£225.00 Inc. VAT

VISCOUNT - Teach yourself LYNX BASIC **£6.95**

SPECTRUM FACTS

Maximum user RAM	13,700 Bytes (approx)
Text Screen	24x30
High Resolution	265x248
Cassette Lead	Included

COLOUR GENIE



A truly reliable micro and highly recommended by **SPECTRUM** featuring powerful and sophisticated COLOUR GRAPHICS, allowing you to create full 8-colour Games, Diagrams and charts quickly and simply. Powerful 16KK RAM memory (expandable internally to 32K) for FULL COLOUR video games and POWERFUL COMPUTING with a full range of inexpensive accessories: 16K RAM pack, Joysticks for TV games, Light Pen, Disk Drive and a Printer. The superb Colour Genie is at SPECTRUM now - check it out and see the Genius at work!

Spectrum LOW Price £224.48 Inc. VAT

COLOUR GENIE ACCESSORIES

Joysticks	£49.49
16K RAM	£38.50
Printer Interface	£39.95
VISCOUNT Teach yourself Colour Genie Basic	£6.95

SPECTRUM FACTS

Maximum user RAM	**14,200 Bytes (approx)**
Text screen	**24x40**
High Resolution	**160x90**
Cassette Lead	**Included**

SINCLAIR ZX SPECTRUM



Yes, this top selling micro is now available from Spectrum in both **16K** and **48K RAM.** So now there's no need to send by Mail Order - just call into your local SPECTRUM dealer and pick one up. But just one word of warning: with this added avilability advantage, stocks are bound to sell fast - so make it soon!

SINCLAIR ZX SPECTRUM 16K - £125.00
SINCLAIR ZX SPECTRUM 48K - £175.00

Spectrum Computer Centres have no connection whatsoever with the ZX-Spectrum Computer manufactured by Sinclair Research Ltd.

SINCLAIR ZX-81

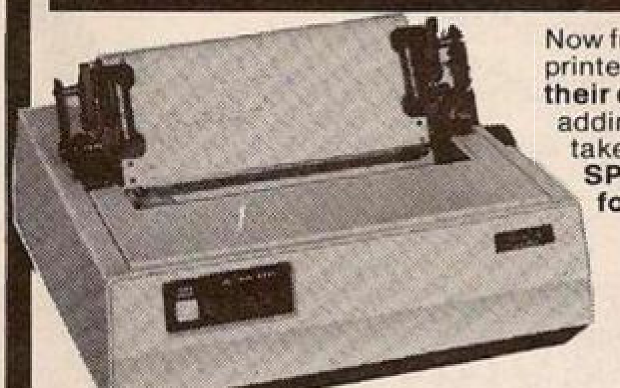


SINCLAIR ZX . . . £49.95
16K RAM pack . . £29.95
ZX Printer £59.95

Computer Bookshop Software for Sinclair Computers	INC. VAT
Bumper 7 1K ZX81	£5.95
1K Super Trio ZX81	£7.95
Labyrinth 16K ZX81	£5.95
Nightmare Park/Music 16K ZX81	£6.95
Computacalc 16K ZX81	£7.95
Personal Banking System 16K ZX81	£11.44
Space Invaders/Rescue 16K ZX81	£6.95
Breakout 16K ZX81	£5.95
Mugsy 16K ZX81	£5.95
Mergatroyds 16K ZX81	£5.95
Progmerge 16K ZX81	£5.95
Football Manager 16K ZX81	£7.95
Cassettes for ZX81 Type—10	
6 Games	£3.95
Junior Education	£3.95
Business & Household	£3.95
Skill & Judgement Games	£3.95
Junior Education	£3.95
Family Quiz	£3.95
Type—20	
Fantasy Games	£4.75
Space Raiders & Bombers	£4.75
Type—30	
Super Programs Nos. 1-8	£4.95
Type—40	
Backgammon	£5.95
Flight Simulation	£5.95
Type—50	
English Literature 1	£6.95
English Literature 2	£6.95
Geography	£6.95
History 1	£6.95
Maths. 1	£6.95

ZX-PANDA
16K RAM PACK
ONLY £24.95

OKI MICROLINE Printers



Now from **SPECTRUM** - this **top selling** range of printers **renowned throughout the world for their quality and reliability.** If you're thinking of adding a printer to your micro then you must take a look at the **MICROLINE** range at **SPECTRUM -NOW!** they're **fantastic value-for-money** especially at our **SUPER LOW prices**

Models Available

MICROLINE MODEL 80
MICROLINE MODEL 82A
MICROLINE MODEL 92

Check with your local SPECTRUM dealer for our SUPER LOW prices.

EPSON



RX-80 and FX Printers now available -check with your local SPECTRUM dealer for details

SEIKOSHA



GP-100A

Now a top quality graphic printer at a price you can afford. Centronics interface connects easily with most micros.
Spectrum LOW price **£229.94** Inc. VAT Cables & Interfaces available for most micros

SMITH CORONA



Model TP-1

Microprocessor controlled, high quality daisy wheel printer at a LOW cost from SPECTRUM. Serial, Parallel or IEEE Interface.
Spectrum LOW price **£557.75** Inc. VAT

BOOKS



SELECTION FROM THE COMPUTER BOOKSHOP	
30 Hour Basic for the BBC Micro	£5.95
Let your BBC Micro Teach You to programme	£6.45
BBC Micro Revealed	£7.95
Over the Spectrum	£6.95
60 Games and Applications for the ZX Spectrum	£4.95
Programming the 6502	£9.95
Programming your ZX Spectrum	£6.95
ZAP Pow Boom for the Vic 20	£7.95
The ZX Spectrum Explored	£5.95
Vic Inovative Computing	£6.95
Mastering Machine Code on your Zx81	£7.50
The ZX Spectrum and how to get the most from it	£5.95
Easy Programming for the ZX Spectrum	£5.95
30 Programmes for the BBC Micro	£4.95
CPM Handbook	£11.50
Programming the Z80	£11.95
20 Best Programmes for the ZX Spectrum	£5.95
Getting aquainted with your Vic 20	£6.95
Machine code and Better Basic	£7.50
The Cambridge Colour Collection (Spectrum)	£6.95
Vic Revealed	£10.00
De RE Atari	£17.00
ATARI Operating system listing	£10.43

MORE SPECTRUM LOW PRICES!

Spectrum Computer Centres have no connection whatsoever with the ZX-Spectrum Computer manufactured by Sinclair Research Ltd.

SHARP MZ-80A



FREE! £75 WORTH of software with every MZ80A purchased

Desk top genius! the all-in-one SHARP MZ-80A. Ready to run the moment you get it home. Built-in keyboard, CRT, 9" display and cassette data storage with 48K RAM. The BASIC with extra useful additions, offers quite a powerful micro for the home or business ■ 4K Byte ROM · 48K Byte RAM · 2K Byte Video RAM ■ ASCII profiled keyboard · numeric pad ■ 2 page Video RAM allows screen to be scrolled up or down ■ CP/M available.

Floppy Disks and Accessories for MZ80A

Twin Floppy Disk unit (inc. 1/0 Card,Disk Cable)	£856.75
Twin Disk Unit (only)	£678.50
Single Floppy Disk Unit	£480.00
Cable for F/D Drive	£29.79

Printers and Accessories for MZ80A, MZ80B & MZ80K

80 Col Tractor Feed Printer inc. Cable 1/0 Card & Rom	£477.25

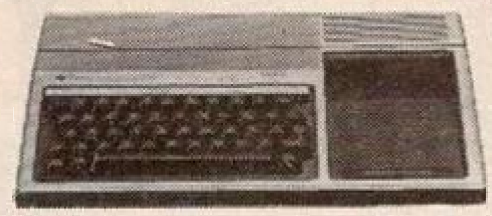
SPECTRUM FACTS

Maximum user RAM	32,000 Bytes (apx.)
Text Screen	25x40
High Resolution	Not available

Cassette Lead, Cassette Player Included.

Spectrum LOW Price £546.25 Inc. VAT

TEXAS TI99/4A



■ 16K RAM (expandable to 48K) ■ Built-in 14K Byte BASIC interpreter ■ 16 Bit Micro-processor ■ 16 Colour High Resolution graphics ■ Extensive range of solid state software command modules available from games to architectural aids.

Spectrum LOW Price £154.95 INC. VAT

SPECTRUM FACTS

Maximum user RAM	14,500 Bytes (approx)
High Resolution	256x192
Cassette Lead	Extra £10.95

TEXAS PERIPHERALS

Speech Synthesizer	£46.58
Peripheral Exp. System	£140.30
Disc Cont. Card	£141.95
Disc Drive	£269.95
RAM Exp. Card	£206.50
Matrix printer	£399.95

There's a Spectrum Centre near you . . .

ABERYSTWYTH
AberData at Galloways, 23 Pier St. 0970 615522

ABINGDON
Ivor Fields Computers, 21 Stert St. 0235 21207

ACCRINGTON
PV Computers, 38A Water St. 0254 36521/32611

ALDERSHOT
David Saunders Computer Centre, 51 Station Rd. 0252 20130

ALFRETON
Gordon Harwood, 69/71 High St. 0773 832078

ASHFORD
Ashford Computer Centre, 2 Station Parade, Clarendon Rd. 07842 44955

BANBURY
Computer Plus, 2 Church Lane. (0295) 55890

BARROW-IN-FURNESS
Barrow Computer Centre, 96 Church St. 0229 38353

BASILDON
Godfrey's, 28-32 East Walk, Town Centre. 0268 289379

BASINGSTOKE
Fisher's, 2/3 Market Place. 0256 22079

BATH
Software Plus, 12 York St. 0225 61676

BEDFORD
Stanad Ltd., 115 Midland Rd. 0234 49341 (Just Opening)

BELFAST
Arthur Hobson Ltd., 37 Great Victoria St. 0232 246336

BIRMINGHAM
Sherwoods, Great Western Arcade. 021 236 7211

BOSTON
Fotosound Computers, 19 Dolphin Lane. 0205 64781

BRADFORD
Photosave, 18 Cheapside. 0274 308598

BRIGHTON
Capricorn, 1 Queens Rd. 0273 29634

BRISTOL
Brensal Computers Ltd., 24 Park Row. 0272 294187 (Just Opening)

BURY (Lancs.)
Micro-North, 7 Broad St. Tel. TBA (Opening Soon)

BURY ST. EDMUNDS
Bury Computer Centre, 11 Guildhall St. 0284 705772

CAMBERLEY
Camera Arts (Micro Computer Division), 36 High St. (0276) 65848

CAMBRIDGE
KP Ltd., 12a Kings Parade. 0223 68087

CANTERBURY
Kent Micro Systems, Conquest House, 17 Palace St. 0227 50200

CARDIFF
Randall Cox, 18-22 High St. Arcade. 0222 31960

CHELMSFORD
Maxton Hayman Ltd., 5 Broomfield Rd. (0245) 354595

CHESHAM
Reed Photography & Computers 113 High St. 0494 783373

COVENTRY
Coventry Micro Centre, 33 Far Gosford St. (0203) 58942

CREWE
Microman, 123 Nantwich Rd. Tel. TBA (Opening Soon)

DARLINGTON
McKenna & Brown, 102 Bondgate. (0325) 59744

DERBY
C T Electronics, at Camera Thorpe, The Spot. 0332 44760

DUMFRIES
Vennals, 71 English St. 0387 4547

DUNSTABLE
Dormans, 7-11 Broad Walk. 0582 65515

EDGWARE
Breaker 1-4, 130 High Street. 01-952 7488/8860

EDINBURGH
The Silicon Centre, 6-7 Antigua St. 031 557 4546

EVESHAM
Tecnicare, The Lodge, Brickiln St. 0386 41484 (Just Opening)

EXMOUTH
Open Channel, 30 The Strand. 03952 4408 (Just Opening)

GLASGOW
Victor Morris Ltd., 340 Argyle St. 041 221 8958

GLOUCESTER
The Model Shop, 79-81 Northgate St. (0452) 410693

GRIMSBY
R. C. Johnson Ltd., 22 Friargate, Riverhead Centre. 0472 42031

GUERNSEY
Grut's, 3-5 The Pollet, St Peters Port. 0481 24682

GUILDFORD
The Model Shop, 23 Swan Lane. (00772) 0483 39115

HAMILTON
Tom Dickson Computers, 8-12 Cadzow St. 0698 283193 (Just Opening)

HARROW
Camera Arts (Micro Computer Division), 24 St. Ann's Rd. 01-427 5469

HATFIELD
Microworld, 2 Crawford Rd. (07072) 64137

HEREFORD
Melgray Hi-Tech Ltd. 49 Broad St. 0432 275737 (Just Opening)

HITCHIN
Camera Arts (Micro Computer Division), 68A Hermitage Rd. 0462 59285

HULL
The Computer Centre (Humberside) Ltd., 26 Anlaby Road (0482) 26297

ILFORD
Prot Enterprises, 1 Centreway, (next to Sainsburys) High Rd. 01-553 0144

IPSWICH
Brainwave, 24 Crown St. 0473 50965

ISLE OF MAN
T. H. Colebourn Ltd., 57-61 Victoria St., Douglas. 0624 3482 (Just Opening)

JERSEY
Audio & Computer Centre 7 Peter St., St. Helier. 0534 74000

KILMARNOCK
Vennals, 49 Foregate 0563 32175

LEEDS
Bass & Bligh, 4 Lower Briggate. 0532 454451

LEICESTER
Youngs, 40-42 Belvoir St. 0533 544774

LITTLEHAMPTON
Alan Chase Ltd., 39 High St. 09064 5674/4545

LIVERPOOL (Aintree)
Hargreaves, 31/37 Warbreck Moor. 051-525 1782

LONDON E8
McGowans, 244 Graham Rd. Hackney. 01-533 0935

LONDON EC2
Devron Computer Centre, 155 Moorgate. 01-638 3339/1830

LONDON SE1
Vic Odden's, 6 London Bdg. Walk 01-403 1988

LONDON SE9
Square Deal, 375 Footscray Rd., New Eltham. 01-859 1516

LONDON SE15
Castlehurst Ltd., 152 Rye Lane, Peckham. 01-639 2205

LONDON SW6
Chelsea Micros Ltd., 14 Jerden Place. 01-385 8494

LONDON N1
ASP Micro Systems, 185 Upper St., Islington. 01-359 9095

LONDON N.20
Castlehurst Ltd., 1291 High Rd. 01-446 2280

LONDON NW9
Moviescope, 459 Kingsbury Rd., London NW9. 01-204 6352

LONDON W1
Devron, 4 Edgware Road. 01-724 2373

LONDON W1
Computers of Wigmore Street, 87 Wigmore St. 01-486 0373

LONDON W3
Colormatic Computers, 44 High St., Acton. 01-992 7611

LONDON W11
Electroleisure, 120 Notting Hill Gate. 01-221 7029

LOUGHTON
Micro & Movie Channel 309 High Rd. 01-508 1216

LOWESTOFT
John Wells, 44 London Rd. North. 0502 3742

LUTON
Terry-More, 49 George St., 0582 23391/2

MACCLESFIELD
Camera & Computer Centre, 118 Mill St. 0625 27468

MANCHESTER
Lomax Ltd., 8 Exchange St., St. Ann's Sq. 061 832 6167

MANCHESTER GTR.
Mr. Micro Ltd., 69 Partington Lane, Swinton. 061 7282282 open Thurs.-Fri.-Sat. till 8 p.m.

MANCHESTER GTR.
PASE, 213-215 Market St., Hyde. 061-366 5935 Telex: 665845

MANCHESTER GTR.
Wilding Ltd., 23 Deansgate, Bolton. 0204 33512

MIDDLESBROUGH
McKenna & Brown, 190 Linthorpe Rd. 0642 248345

NEWCASTLE-ON-TYNE
Newcastle Camera & Computer Mart, 16 Northumberland Ct. 0632 327461

NEW MALDEN
Surrey Micro Systems, 31 High St. 01-942 0478

NEWPORT (Gwent)
Randall Cox, 118 Commercial St. 0633 67378

NORTHAMPTON
Basic Computers & Systems Ltd., 72 Kingsthorpe Hollow. 0604 710740

NORTHWICH
Camera & Computer Centre, 3 Town Sq. (0606) 45629

NORWICH
Sound Marketing, 52 St Benedicts St. 0603 667725

NOTTINGHAM
Cameo Computers, 8/9/10 Trinity Walk. 0602 42912

NOTTINGHAM
Basic 39-41 Trent Boulevard, West Bridgeford 0602 819713

OLDHAM
Home & Business Computers Ltd., 54 Yorkshire St., 061-633 1608

PAIGNTON
Devon Computers, 81 Upper Manor Rd. (0803) 526303

PEMBROKE
Randall Cox, 19 Main St., 064 668 2876

PETERBOROUGH
Peterborough Communications 91 Midland Rd. 0733 41007

PETERHEAD
North East Computers 1-3 Ellis St. 0779 79900

PORTSMOUTH
Computer Corner, 261 Commercial Rd. 0705 833938 (Opening Soon)

PORTSMOUTH Waterlooville
GB Microland, 7 Queens Prde. 07014 59911 (Just Opening)

PORT TALBOT
Micro Gen, 6 Royal Buildings, Talbot Road. 0639 887730 (Just Opening)

PRESTON
Wilding's, 49 Fishergate. 0772 556250

READING
David Saunders Computer Centre, 8 Yield Hall Plce. 0734 580719

ROTHERHAM
Kenneth Whitehead, 2 Market St. 0709 62594

RUGBY
The Rugby Micro Centre, 9-11 Regent St. 0788 70522

SEVENOAKS
Ernest Fielder Computers, Dorset St. 0732 456800

SHEFFIELD
Superior Systems Ltd., 178 West St. 0742 755005

SOUTHAMPTON
R. J. Parker & Son Ltd., 11 Portsmouth Rd., Woolston, Southampton. 0703 434137/8

SOUTHPORT
Central Computers, 575 Lord St. 0704 31881

STAFFORD
Computerama, 59 Forgate St. (0785) 41899

STEVENAGE
D. J. Computers 11 Town Sq. 0438 65501

STIRLING
R. Kilpatrick, 58 Port St. 0786 5532 (Just Opening)

STOCKPORT
Wilding Ltd., 1 Little Underbank, Stockport. 061-480 3435

STOKE-ON-TRENT
Computerama, 11 Market Sq. Arcade, Hanley. 0782 268620

ST. ALBANS (Herts)
Clarks Computer Centre, 14-16 Holywell Hill. 0727 52991

ST. AUSTELL
A B & C Computers, Duchy House, 6 Lower Aylmer Sq. 0726 64463

TAUNTON
Grays, 1 St James St. 0823 72986

TEDDINGTON
"Andrews", 49 Broad St. 01-977 4716

WALLINGTON
Surrey Micro Systems Ltd., 53 Woodcote Rd. 01-647 5636

WARRINGTON
Wildings, 111 Bridge St. 0925 38290

WATFORD
SRS Microsystems Ltd., 94 The Parade, High St. 0923 26602

WEST BROMWICH
Bell & Jones, 39 Queens Sq. 021 553 0820

WESTON-SUPER-MARE
K. & K. Computers, 32 Alfred St. Tel. TBA (Opening Soon)

WHITEHAVEN
P. D. Hendren, 15 King St. 0946 2063

WIDNES
Computer City, 78 Victoria Rd. 051 420 3333

WIGAN
Wilding Ltd., 11 Mesnes St. 0942 44382

WOKING
Harpers, 71-73 Commercial Way. 04862 61061

WORCESTER
David Waring Ltd., 1 Marmion House, High St. 0905 27551

GT. YARMOUTH
Tony Hood Electronic, 26a Market Gate Shopping Centre 0493 3143

YORK
York Computer Centre, 7 Stonegate Arcade. 0904 641862

Not all stores carry every advertised item, please phone before making a journey — Prices correct at time of going to press E. & O.E.

Do you have a problem? Your manual is incomprehensible or you just cannot get the hang of that programming trick you tried — whatever it is, Tim Hartnell will do his best to answer your queries. Please include only one question per letter and mark them "Response Frame".

ACE MEMORY

I have recently bought a Jupiter Ace. I find the 3K on board rather restrictive. What is the easiest way to expand the memory, and what size can I go up to?

Donald Towlinson, Yate, Bristol.

A 16K RAMPACK for the Ace is available from Stonechip Electronics, Unit 9, The Brook Industrial Estate, Deadbrook Lane, Aldershot, Hampshire. The company told me that although it is supplied as a 16K unit, it can be expanded — using chips available from them — to 32K. The extra 16K costs £19.95. You can get more details by calling the company on 0252-318260. If you want to discuss your computer with other Ace owners, you might like to get in touch with the users' club. Send a stamped, addressed envelope to Remsoft, 18 George Street, Brighton, BN2 1RH.

BOARD GAMES

My particular computer interest is in playing board games but I would like to enlarge the normal miniscule playing board from eight by eight to 24 by 24. I gather that this can easily be done on the ZX-81 by Poking into the variable which controls the bottom half of the screen. If, however, I Poke 23659 with zero on the Spectrum I get a blank screen, remedied by altering the Border colour, but the computer then locks up. Is there a solution?

D G Daverson, Brentwood.

THERE ARE two ways around this. Either use Print hash, or change your board size to 16 by 16. This allows you to have each square on the board occupying four character cells, and some pretty elaborate pieces can be created with user-defined graphics to fit within the 16 by 16 matrix.

MISSILE GAP

I own an Atari 400 computer. Knowing that you have one, I decided to enquire about some things which I do not understand. I have been told that there are player-missile graphics but none of the numerous books and papers which I got with the computer signified what player-missile graphics are, or how they can be operated. Can you enlighten me? I would also like to know how one can use the user-definable graphics characters.

Thomas Martin, Kerridge, Macclesfield.

PAUL BUNN, in his book *Making the Most of Your Atari,* explains that there are four players and four missiles on the computer, each with its own colour register, size register and horizontal position register. A player is exactly eight bits wide by either 128 — double — or 256 — single-line resolution. To create your player, you plot the squares on a grid which is eight by whatever height you want the player to be. You then put the numbers 128, 64, 32, 16, 8, 4, 2 and 1 above the grid, adding the value if the square for the shape is filled in.

ORIC NOTICE

I am thinking of buying an Oric computer. I will be using it, among other things, as a kind of electronic bulletin board for a club I belong to. I have seen that you can get tall letters on the BBC Micro. Is it possible to do the same with the Oric? I cannot afford a BBC machine, and have heard that the Oric would be a good second choice.

Patrick Shepson, Leighton Buzzard.

THE ORIC has a number of commands — including the colour ones, of course — to enable you to dress up your text output. You can get double-height characters by using Control D. If you want double-height characters, you enter as part of the program

```
PRINT CHR$(4);CHR$(27);"J
....followed by text".
```

The J will not be printed. Change the J to an N to get double-height, flashing characters.

WORD PROCESS

I am a newcomer to microcomputers and with *Your Computer* and a subscription to some books, have been trying to learn more about the mountain of hardware and software available. I want to be able to do word processing but it seems that as printers go from 80 characters upwards, to have a microcomputer displaying 32 characters is not the best way of doing it. To have to scroll a 32-character screen left to right does not seem ideal. As I am an accountant, I want to be able to compile financial software. But I feel that disc drives will make some computers I am considering, such as the NewBrain, too expensive. The Spectrum for the price seems excellent, especially with the Microdrive. Could you give me an assessment of the home-study Basic course offered by the NCC. Is it of any use to a beginner?

B J Owen, Riyadh, Saudi Arabia.

A BBC MICRO with word processor ROM would solve your word processing problems, but you would have to check that a suitable accountancy package is available; and also whether you can afford to add discs to the BBC machine when you get it. The NCC course has sold extremely well. While not the breeziest presentation of the subject matter available, it covers the field very competently and carefully. It is one of the best overall introductions to Basic available at the moment.

INCOMPATIBILITY

I am still waiting for my Spectrum to be delivered. I do not know much about the machine code. I would like to know if I can use the ZX-81 machine-code articles featured in the past in *Your Computer,* and if not, what modifications would be needed to get them to work.

Farid Ehsan, Portswood, Southampton.

UNFORTUNATELY, the short answer is "No". Most machine-code programs put material on to the screen, and the routines to do this need to be totally rewritten for the Spectrum.

DRAGON DAZE

I have seen a great deal of software advertised for the Dragon 32. I have only had my Dragon for a month, and am quite bewildered as to which is the best software to buy. I am mainly interested in arcade games. Can you advise me?

Gwyn Parkly, Paisley, Renfrewshire.

THE SCOTTISH Dragon Club, 1 Walker Street, Edinburgh may well be able to help you with information on commercial software. Suppliers of Dragon software include APG. Software, 24 Mountain View, Peel, Isle of Man; Stanley Software, 91 Cradley, Widnes, Cheshire; Saint George Software, 73 Ling Street, Liverpool, L7; DACC, 23 Waverley Road, Hindley, Greater Manchester, WN2 3BN; Juniper Computing, 8 Pembroke Green, Lea, Malmesbury, Wiltshire SN16 9PB; and Wizard Software, PO Box 23, Dunfermline, Fife, KY11 5RW. There are also a number of Dragon books around including *Dragon Load and Go, Making the Most of Your Dragon 32, Enter the Dragon* and *Dynamic Games for the Dragon 32.* See also last month's review of Dragon software in *Your Computer.*

DRAGON LORE

I have recently bought a Dragon 32 computer and would like to know if you could recommend a book on programming in extended Basic. Also, could you tell me which other computer software is compatible with the Dragon?

Mrs J Begg, Abergavenny, Gwent.

THERE ARE two books on programming in Tandy Color Computer Basic available from Tandy dealers. Although these books deal with the Tandy Color Computer, they apply to the Dragon as the two computers appear to have virtually identical ROMs. Because of this, Tandy Color Computer programs will run on the Dragon 32, if you manage to buy the software on cassette. As well as the books sold by Tandy, there are several other books on programming the Tandy Color Computer available in the U.K. which should prove of use. You will probably find them advertised in this issue of *Your Computer.*

ROM SWEET ROM

Reading the BBC Microcomputer literature, I see that "up to four different 16K interpreters" may be fitted inside the machine, and that the Basic interpreter supplied is classed as one of these. Are the other language ROMs — Pascal, Forth and Lisp — available yet? Is the mnemonic assembler part of the Basic ROM or is it part of the 16K machine's operating system, and therefore able to be accessed by the other language ROMs. Will it be possible to buy the Micro fitted with one of the other languages as standard instead of the Basic interpreter being supplied?

M E Needham, Clitheroe, Lancashire.

THE OTHER language ROMs are being developed in order, with the Pascal one first. The assembler is part of the Basic ROM, and therefore cannot be accessed by the other language ROMs. However, it is possible that the other ROMs may include assemblers. Acorn tells me it has no plans to release the computer with any onboard language, as the initial choice, except Basic. ■

THE DRAGON DUNGEON

TAKE INVENTORY!

You've tried N,S,E and W and failed to find the particular treasure of your quest. Now is the time to "take inventory" at the Dragon Dungeon.

The Dungeon vaults are filled with peripherals, books, software and other goodies, exclusively for the Dragon 32 owner — from recorder leads to Editor/Assemblers and from arcade games to Data Base Management Systems.

Our stock of software is selective, since we believe in value-for-money. Feed your Dragon on the best programs! Current best-seller: Salamander's superb 'Dragon Trek' (£9.95).

We try to stock everything published on the Dragon. Try the 'Dragon Companion' (£4.95) and discover 12 graphics modes! Current best-seller: David Lawrence's 'The Working Dragon 32' (£5.95).

'Textstar', which stores six pages of A4 per loading, now in stock (£12.95).

Send for current listings.



DRAGON STICKS

Top quality double-potentiometer joysticks, for the Dragon owner who demands arcade action. Sensitive, but tough and reliable, Dragon Sticks will keep on zapping when others fail! £19.95 per pair, inclusive VAT and postage.



DRAGON'S TEETH

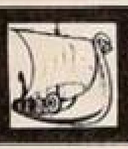
The Dragon Owner's Club monthly newsletter is packed with news, reviews and information for the dedicated Dragon-basher. The Dungeon Master is collecting all your tips, discoveries, reviews and "beefs" and will send out guidelines and payment rates to those of you who feel like breaking into print!

'Dragon's Teeth', which is published in the last week of every month, includes hardware and software offers, Club members adverts and local Dragon user-group news. Badges, T-shirts, Dragon sweaters and similar for extrovert owners!

Annual Membership (including 'Dragon's Teeth') £6.00 six-month trial subscription £3.25.

THE DRAGON DUNGEON
P.O. Box 4, Ashbourne, Derbys. DE6 1AQ. Tel: Ashbourne 44626

Viking Software



COMMODORE 64 + VIC 20 SOFTWARE FROM VIKING



PONTOON
£5.95



3D ESCAPE
£5.95



***BASIC FRENCH**
£5.95

DRAUGHTS £4.95
OTHELLO £4.95
*FRENCH TEST 1 . . . Improve your basic French with this course of words and phrases £7.95
CODEMASTER £5.95
*STOCKETTE . . . Small stock package on tape for stock control of your small business £14.95
NEW — ZX SPECTRUM CODEMASTER (MASTER MIND) £5.95
PACK OF 10 C12 BLANK COMPUTER TAPES £5.00
NEW — VIC-20 16K RAM PACK (SWITCHABLE TO EITHER 3, 8 OR 16K) NOW ONLY £39.95
*REQUIRES AN ADDITIONAL 8K OR 16K RAM PACK ON THE VIC 20 COMPUTER.

CBM 64 ONLY
HOME ACCOUNTS .... Keep your home accounts on the 64 with this excellent package. Budget, allocate and video your current financial state at any time £9.95
STOCKAID .... The ultimate in disk based stock systems. 1200 items, with orders and suppliers on a 1541 disk drive. Full reporting and stock valuations etc. Send for fact sheet £75.00

DEALER ENQUIRIES WELCOME
Please make cheques/P.O.'s payable to:
VIKING SOFTWARE
Unit 3, Meadow View, Browston Lane, Browston, Gt Yarmouth, Norfolk NR31 9DP
stating machine required

The key to PROFESSIONAL SOFTWARE for PERFECTIONISTS

NEW 2M SOFTWARE

- Ⓝ NEWBRAIN
- Ⓑ BBC
- Ⓜ MPF - II
- Ⓥ VIC - 20
- Ⓓ DRAGON - 32

Ⓝ **The Accountant Set of 2 Programmes**
- SALES Ledger
- PURCHASE Ledger

Menu driven, Complete Accounts Ledger systems including a Print Analysis - Hard Copy and other functions you only expect on Disc systems. Including a 12 pg. User Manual.
Cassette versions £55.00 each.
Both Programmes £100.00 the set.

Ⓝ **The Librarian -**
- KARD Index,

is Menu driven, with excellent sort routines and giving you a % of Memory remaining on every entry. One programme being user definable.
Cassette versions £28.95 each.

Ⓝ **Telephonist -**
A Directory so comprehensive that it will become a must for all serious users. Sort routines on any field and 3 digit recognition.
Cassette version £20.00

Ⓝ **Filing Clerk**
The answer to all your worries; A page Filing System with all the menu driven functions you only find on large Databases. Together with a 12 page User Manual.
Cassette Version £30.00.

Ⓝ **Calc-A-Chart & Analysist (available soon)**

Ⓑ **Composer**
A Programme with the heart of a Master Composer, giving you a chance to compose a classic, with automatic notation.
Cassette version for Model 'B' £6.95

Ⓓ **Dragon Ledger**
Either Sales or Purchase, this Programme gives you all you need to run a small Business. Includes VAT and Print analysis together with a 12 pg User Manual.
Cassette Version £49.95

Dealer/Trade discounts available for quantity

Cash with orders for immediate delivery

ACCESS CARD HOTLINE - (0562) 742142.

WE GUARANTEE DESPATCH WITHIN 24 HOURS

All Prices include VAT

P & P 50p

MICRO COMPUTER MART

MICRO HOUSE
GREENHILL
INDUSTRIAL EST
KIDDERMINSTER
WORCS

Tel:(0562) 742142

'ALSO SEE ADVERT ON PAGE 187'

SOFTWARE FILE

Software File gives you the opportunity to have your programs, ideas and discoveries published. We will accept contributions for any home computer provided they are submitted to *Your Computer* exclusively. Please double-check your programs and specify the memory they require before sending them, preferably on cassette. We pay between £6 and £36 for contributions published.

Millipede

Shingo Sugiura,
Putney,
London.

BBC

YOU MUST guide a hungry baby millipede gobbling up red fruits whilst avoiding the deadly rocks. Naturally, if you guide him backwards he will bite himself and die. Every time he eats a fruit he grows by one segment. When it reaches a length of 40 segments, you will have to guide another faster baby millipede on a new screen.

You have 3 lives at your disposal. The score is constantly updated and because all the calculations and the printing of the millipede's segments are done in machine code, the action is very fast. If you want to change your speed press Escape, this will revert you back to the instructions without clearing the high score. Use Z & X for left and right respectively, and the colon and oblique stroke for up and down.

Lines 50 to 240	machine code
Lines 250 to 330	sets up screen
Lines 340 to 500	main program
Lines 520 to 700	initialise variables
Lines 710 to 900	instructions
Lines 910 to 1030	sets up screen
Lines 1040 to 1090	prints the rocks
Lines 1110 to 1200	prints the fruits
Lines 1210 to 1240	prints score and high score
Lines 1250 to 1280	new screen procedure
Lines 1290 to 1310	checks the colour in front of head
Lines 1320 to 1360	death procedure
Lines 1370 to 1390	ending procedure
Lines 1400 to 1420	delay procedure

```
   2 REM ****** MILLEPEDE ******
   3 REM ** (c)  March  1983  **
   4 REM ** By Shingo Sugiura **
   5 REM ***********************
   6
  10 ON ERROR GOTO 30
  20 hi%=50
  30 MODE7:PROCinst
  40 HIMEM=&2800:OSWRCH=&FFEE:LGTH%=&70:HEAD%=&71
  50 FOR I%=0 TO 2 STEP 2:P%=&2800
  60   [OPTI%
  70   LDY #40
  80   .LOOP
  90   LDA &2C1F,Y
 100   STA &2C20,Y
 110   LDA &2C51,Y
 120   STA &2C52,Y
 130   DEY
 140   BNE LOOP
 150   LDY (LGTH%)
 160   .ANI
 170   LDA #31:JSR OSWRCH
 180   LDA &2C20,Y:JSR OSWRCH:LDA &2C52,Y:JSR OSWRCH
 190   LDA #225:JSR OSWRCH
 200   DEY
 210   BNE ANI
 220   LDA #31:JSR OSWRCH:LDA &2C20:JSR OSWRCH:LDA &2C52:JSR OSWRCH
 230   LDA HEAD%:JSR OSWRCH
 240   RTS:]NEXT I%
 241
 250 score%=0:life%=3:screen%=1
 260 HIMEM=&2800
 270 VDU22,1,23;10,32;0;0;0;19,3,2;0;17,1,17,131,12
 280 HIMEM=&2800
 290 PROCdata
 300 PROCinit
 310 PROCwall
 320 PROCobst
 330 PROCfood
 340 REPEAT
 350 IF INKEY(-98)=-1 THEN A$="LEFT"
 360 IF INKEY(-67)=-1 THEN A$="RIGHT"
 370 IF INKEY(-73)=-1 THEN A$="UP"
 380 IF INKEY(-105)=-1 THEN A$="DOWN"
 390 PRINTTAB(?(&2C20+?LGTH%),?(&2C52+?LGTH%));" "
 400 IF A$="LEFT" THEN ?&2C20=(?&2C20)-1:?HEAD%=229
 410 IF A$="RIGHT" THEN ?&2C20=(?&2C20)+1:?HEAD%=228
 420 IF A$="UP" THEN ?&2C52=(?&2C52)-1:?HEAD%=226
 430 IF A$="DOWN" THEN ?&2C52=(?&2C52)+1:?HEAD%=227
 440 VDU26:col%=POINT(?&2C20*32+16,(31-?&2C52)*32+16)
 450 IF col%<>3 THEN PROCcheck
 460 PROCnumerics
 470 CALL &2800
 480 PROCwait(speed%)
 490 UNTIL ?LGTH%>=40:PROCnew_screen
 500 GOTO270
 510                     **********************************
 520 DEFPROCinit
 530 ENVELOPE1,1,3,2,-2,6,6,6,100,0,0,-5,100,0
 540 VDU23,224,255,255,255,255,255,255,255,255
 550 VDU23,225,24,36,126,189,189,126,36,24
 560 VDU23,226,66,36,24,126,219,126,60,24
 570 VDU23,227,24,60,126,219,126,24,36,66
 580 VDU23,228,16,57,106,252,252,106,57,16
 590 VDU23,229,8,156,86,63,63,86,156,8
 600 VDU23,230,0,24,40,92,126,190,127,120
 610 col%=3
 620 A$="RIGHT":?LGTH%=2
 630 Screen=1
 640 ENDPROC
 650 DEFPROCdata
 660 FOR Xdata=0 TO 40
 670   ?(&2C20+Xdata)=Xdata+15:NEXT Xdata
 680 FOR Ydata=0 TO 40
 690   ?(&2C52+Ydata)=15:NEXT Ydata
 700 ENDPROC
 701
 710 DEFPROCinst
 720 PRINTTAB(13,1);CHR$(130);CHR$(141)"MILLEPEDE"
 730 PRINTTAB(13,2);CHR$(130);CHR$(141)"MILLEPEDE"
 740 PRINT'CHR$(131);TAB(11);"BY SHINGO SUGIURA"
 750 PRINT'CHR$(132);"You must guide the growing millipede"
 760 PRINT CHR$(132);"towards the ripe fruits while avoiding"
 770 PRINT CHR$(132);"the rocks ."
 780 PRINT CHR$(132);"If you try to guide him backwards he"
 790 PRINT CHR$(132);"will bite him self and die."
 800 PRINT CHR$(132);"  You have 3 lives."
 810 PRINT" To change level press ESCAPE .."
 820 PRINT'CHR$(133);"CONTROLS:-"
 830 PRINT'CHR$(134);"UP    ------------ ':'"
 840 PRINT CHR$(134);"DOWN  ------------ '/'"
 850 PRINT CHR$(134);"LEFT  ------------ 'Z'"
 860 PRINT CHR$(134);"RIGHT ----------- 'X'"
 870 PRINT'" Input speed (0 Fast to 9 slow) ";:REPEATI%=INSTR("0123456789",GET$
)):UNTILI%:PRINT;I%-1:speed%=(I%-1)*10
 880 PRINT'CHR$(136);CHR$(130);TAB(7);"Press SPACE BAR to start";
 890 REPEAT UNTIL GET=32
 900 ENDPROC
 901
 910 DEFPROCwall:COLOUR0
 920 VDU31,13,0,226:PRINT" MILLEPEDE ";CHR$226
 930 PRINT TAB(2,2);STRING$(36,CHR$224)
 940 PRINT TAB(2,28);STRING$(36,CHR$224)
 950 FOR WALL=2 TO 27
 960   PRINTTAB(2,WALL)CHR$224
 970   PRINTTAB(37,WALL)CHR$224
 980   SOUND &11,-10,WALL*2+100,2
 990   PROCwait(50)
1000   NEXT WALL
1010 PRINT TAB(3,30);"Score ";score%;TAB(20,30);"High score ";hi%;
1020 PRINT TAB(3,31);"Lives left ";life%;TAB(20,31);"Screen ";screen%;
1030 ENDPROC
1031
1040 DEFPROCobst
1050 FOR OBST=1 TO screen%*3+10
1060   PRINTTAB(RND(33)+3,RND(24)+2)CHR$230
1070   SOUND0,-15,6,1
1080   PROCwait(100)
1090   NEXT OBST:ENDPROC
1100
1110 DEFPROCfood:COLOUR1
1120 FOR FOOD=1 TO 50
1130   PROCwait(100)
1140   SOUND1,-10,RND(200),1
1150   PRINTTAB(RND(33)+3,RND(24)+2);"*"
1160   NEXT FOOD
1170 VDU17,0,31,17,15,228,17,1
1180 PRINT TAB(18,15);" Ready !":PROCwait(2000)
1190 PRINT TAB(18,15);"         "
1200 ENDPROC
1201
1210 DEFPROCnumerics:COLOUR0
1220 IF score%>=hi% THEN hi%=score%
1230 PRINT TAB(9,30);score%;TAB(31,30);hi%
1240 ENDPROC
1241
1250 DEFPROCnew_screen
1260 PROCwait(2000)
1270 screen%=screen%+1:speed=speed-10:IF speed<0 THEN speed=0:CLG
1280 ENDPROC
1281
1290 DEFPROCcheck
1300 IF col%=1 THEN score%=score%+1:?LGTH%=(?LGTH%)+1:SOUND1,1,1,3:ENDPROC
1310 IF col%=0 THEN PROCdead:ENDPROC
1311
1320 DEFPROCdead
1330 SOUND0,1,50,5
1340 PROCwait(1500)
1350 life%=life%-1:IF life%<0 THEN PROCend
1360 CLG:GOTO270:ENDPROC
1361
1370 DEFPROCend
1380 PRINT"DEAD":PRINT"Press SPACE BAR to replay ":REPEAT UNTIL GET=32
1390 GOTO250:ENDPROC
1391
1400 DEFPROCwait(T%)
1410 FOR Delay%=0 TO T%:NEXT Delay%
1420 ENDPROC
```

Surrounded

Mark Easton,
Mapperley,
Nottingham.

ZX-81

SURROUND IS a novel addictive game for the ZX-81, requiring a good strategic mind. The program takes up just under 4K of memory. The instruction and a sample of the graphics are shown with the listing. In order to make the program easier to understand, Rem statements are included. The program gives a good example of how to Peek and Poke into the display file. Another interesting point is line 2020. This one line replaces:

IF R = 4 THEN LET CP = CP + 1
IF R = 3 THEN LET CP = CP–1
IF R = 2 THEN LET CP = CP + 33
IF R = 1 THEN LET CP = CP + 33

```
  1 REM [illegible]
  2 REM [illegible]
  3 LET HG=0
  5 GOSUB 9100
 10 LET PO=110
 20 GOSUB 1000
 30 LET Z=6
 40 LET G=0
100 LET I$=INKEY$
105 IF I$="" THEN GOTO 100
110 LET L=PO
115 IF (CODE I$)>36 OR (CODE I$
)<33 THEN GOTO 100
120 LET PO=PO+(I$="8")-(I$="5")
+33*((I$="6")-(I$="7"))
125 LET G=G+1
127 LET PP=PEEK 16396+256*PEEK
16397+PO+1
```

(continued on next page)

(continued from previous page)

```
 130 IF PEEK PP=128 THEN GOTO 90
00
 135 IF PEEK PP=52 THEN GOTO 900
0
 137 IF PEEK PP=10 THEN GOTO 800
0
 140 POKE PP,23
 145 POKE (PEEK 16396+256*PEEK 1
6397+L+1),0
 150 GOSUB 2000
 155 PRINT AT 21,29;G
 160 GOTO 100
1000 REM **DRAW PLAYING AREA**
1001 FOR A=1 TO 6
1002 PRINT AT RND*6,RND*30;"O"
1004 NEXT A
1006 PRINT AT 0,0;
1007 PRINT "████████████████████
████████████"
1010 FOR A=1 TO 8
1020 PRINT "█";TAB 31;"█"
1030 NEXT A
1035 FOR A=1 TO 12
1040 PRINT "████████████████████
████████████"
1042 NEXT A
1043 PRINT AT 19,0;"████████████
████████████████████"
1044 PRINT "████████████████████
████████████████████████████████
████████████"
1045 PRINT AT 3,11;"*"
1046 PRINT AT 21,2;HG
1050 RETURN
1999 REM **PLACE BLOB**
2000 LET CP=PO
2010 LET R=INT (RND*4)+1
2020 LET CP=CP+(R=4)-(R=3)+33*((
R=2)-(R=1))
2025 LET PZ=PEEK 16396+256*PEEK
16397+CP+1
2030 IF PEEK PZ=128 THEN GOTO 20
00
2035 IF PEEK PZ=52 THEN GOTO 210
0
2040 POKE PZ,128
2050 RETURN
2099 REM **EXPAND FRAME**
2100 LET Z=Z+1
2102 IF Z>18 THEN LET Z=18
2105 POKE PZ,0
2107 POKE PP,23
2110 PRINT AT Z,1;"

2115 PRINT TAB 1;"

2120 PRINT AT Z,(RND*28)+1;"O";A
T Z+1,(RND*28)+1;"O"
2130 RETURN
7999 REM **YOU WIN**
8000 PRINT AT 0,8;"WELL DONE"
8002 POKE (PEEK 16396+256*PEEK 1
6397+L+1),0
8004 POKE PP,151
8010 GOTO 9030
8999 REM **YOU ARE DESTROYED**
9000 POKE (PEEK 16396+256*PEEK 1
6397+L+1),0
9010 POKE PP,8
9020 PRINT AT 0,10;"[illegible]"
9030 IF G<=HG THEN GOTO 9050
9040 PRINT AT 1,5;"YOU HAVE THE
[illegible]"
9045 LET HG=G
9046 PRINT AT 21,2;G
9050 PRINT AT 20,8;"HIT ANY KEY"
9060 PRINT AT 21,29;G
9065 IF INKEY$<>"" THEN GOTO 906
0
9070 IF INKEY$="" THEN GOTO 9070
9075 CLS
9080 GOTO 10
9100 REM **INSTRUCTIONS**
9110 PRINT TAB 11;"SUROUND"
9120 PRINT
9130 PRINT "  THE GAME TAKES PL
ACE IN A","BLACK FRAME CONTAININ
G ABOUT 6","DEATH PITS ""O"", WH
CH YOU MUST","AVOID. YOU PEICE I
S ""*"""
9140 PRINT "  HOWEVER, AFTER YO
UR TURN,THE","COMPUTER WILL PLAC
E A BLOB ""█""","IN A VACANT SQU
ARE IN AN ATTEMPTTO SUROUND YOU.
 IF YOU HIT A","BLOB THEN YOU AR
E EVAPOURATED."
9150 PRINT "  BUT IF YOU MANAGE
 TO MAKE A","BLOB LAND ON A PIT
YOU WILL SEE","THAT THE FRAME EX
PANDS. THE ONLYWAY TO SURVIVE CE
RTAIN DEATH IS","TO REACH THE GR
AY LINE, WHICH","CAN ONLY BE REA
CHED BY FULLY","EXPANDING THE FR
AME. BUT DON""T"," EXPAND IT PAS
T THE GRAY LINE."
9160 PRINT AT 21,0;"(HIT ANY KEY
 TO CONTINUE)"
9170 IF INKEY$="" THEN GOTO 9170
9180 CLS
9190 GOSUB 1000
9200 PRINT AT 10,1;"   THIS IS T
HE FRAME.  [illegible] USE
 THE ARROWED KEYS  [illegible]
R DON'T MOVE UNTIL [illegible]
 THERE IS NO NEED  [illegible]
"
9210 PRINT AT 21,0;"HIT ANY KEY
[illegible]"
9220 IF INKEY$<>"" THEN GOTO 922
0
9230 IF INKEY$="" THEN GOTO 9230
9240 CLS
9250 RETURN
9998 SAVE "SUROUN█"
9999 RUN
```

Block blitz

Robert Newton,
Wadhurst,
Sussex.

SPECTRUM

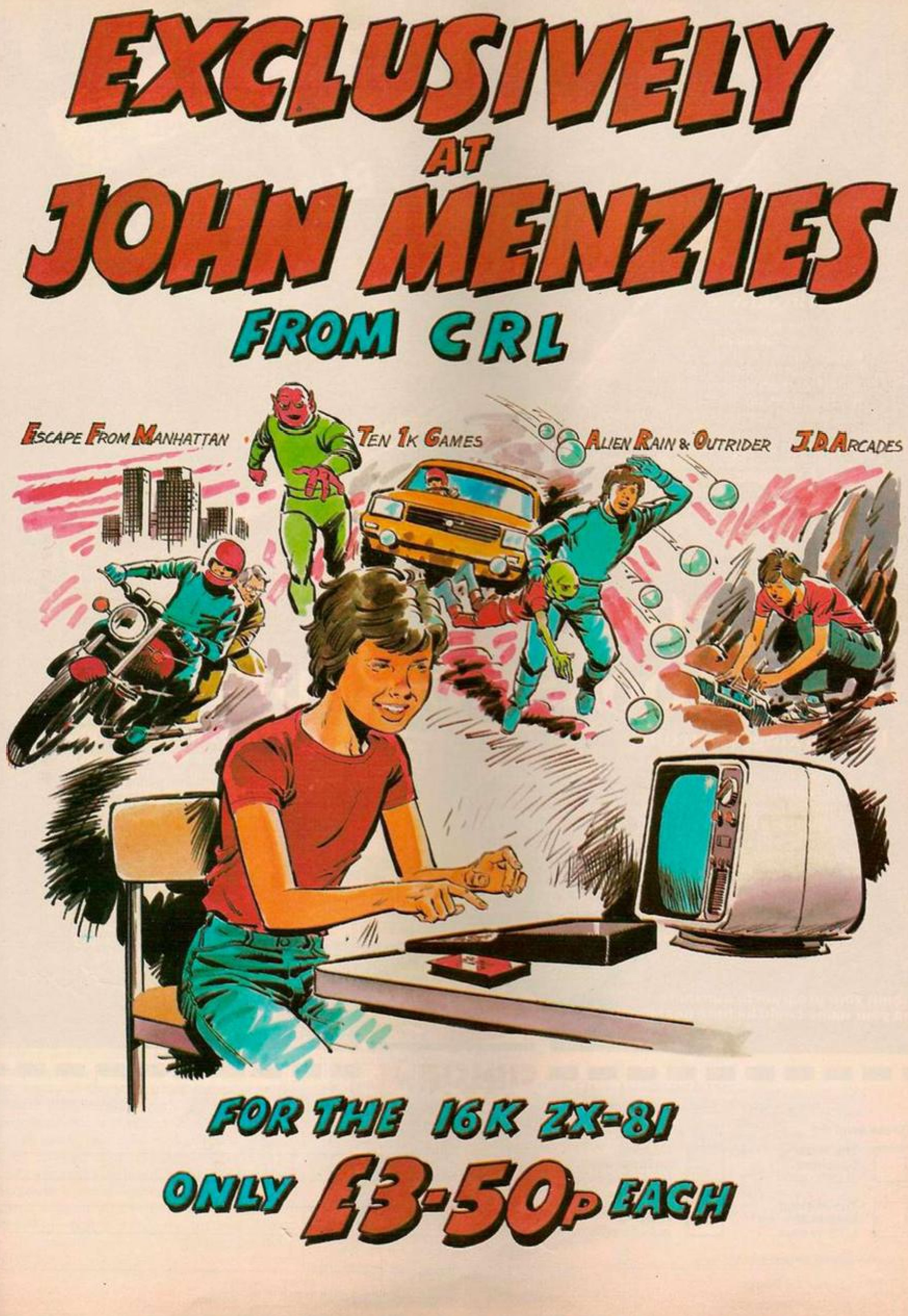
THIS COMBINES attractive graphics with very interesting sound effects. It is based upon the Vic-20 game of Blitz and helpfully tells you how many people you massacred if your aircraft runs into too many tower blocks. A high-score routine and variable number of chances have been included to add the competitive nature of the game. If the subroutine at line 7000 is included, then it will start up with some attractive large characters using the machine-code routine of the Horizon cassette which every Spectrum owner will have. Just run one of the programs on the Horizons cassette and then break the program and type in as a direct command:

SAVE "mc" CODE 32256, 300

to be saved, after the Blitz program on cassette.

```
  10 REM       blitz
  11 RESTORE : LET hc=1000: LET
K=0: BORDER 4: PAPER 0: INK 7: C
LS
  20 REM set up graphics
  30 DATA 255,60,126,255,255,255
,126,24
 110 FOR n=0 TO 7
 120 READ a
 130 POKE USR "a"+n,a
 140 NEXT n
 150 REM bomb= "A"
 160 DATA 24,24,102,102,219,219,
219,255
 240 FOR n=0 TO 7
 250 READ a: POKE USR "b"+n,a
 260 NEXT n
 270 REM "B"
 280 DATA 219,219,219,255,219,21
9,219,219
 360 FOR n=0 TO 7
 370 READ a
 380 POKE USR "c"+n,a
 390 NEXT n
 400 REM "C"
 410 DATA 231,231,231,255,255,23
1,231,231
 490 FOR n=0 TO 7
 500 READ a
 510 POKE USR "d"+n,a
 520 NEXT n
 530 REM "D"
 540 DATA 24,24,24,24,60,126,231
,231
 620 FOR n=0 TO 7
 630 READ a
 640 POKE USR "e"+n,a: NEXT n
 650 REM "E"
 660 DATA 24,60,126,219,153,153,
255,255
 740 FOR n=0 TO 7
 750 READ a
 760 POKE USR "f"+n,a
 770 NEXT n
 780 REM "F"
 790 DATA 255,153,255,153,255,15
3,255,255
 870 FOR n=0 TO 7
 880 READ a: POKE USR "g"+n,a
 890 NEXT n
 900 REM "G"
 910 DATA 255,146,73,146,73,146,
73,255
 920 DATA 146
 930 DATA 73
 940 DATA 146
 950 DATA 73
 960 DATA 146
 970 DATA 73
 980 DATA 255
 990 FOR n=0 TO 7
1000 READ a: POKE USR "h"+n,a
1010 NEXT n
1020 REM "H"
1030 CLS
1035 INK 2: BRIGHT 0
1040 PRINT AT 21,0;"HHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHH"
1050 FOR y=20 TO 14 STEP -1
1080 PRINT AT y,2;"CC";AT y,5;"D
";AT y,7;"G";AT y,9;"DG";AT y,12
;"CC";AT y,15;"DGG";AT y,19;"C";
AT y,20;"CGG";AT y,24;"G";AT y,2
6;"CDDGC"
1090 NEXT y
1100 PRINT AT 13,2;"CF";AT 13,5;
"D";AT 13,7;"G";AT 13,9;"EG";AT
13,12;"BC";AT 13,15;"FGE";AT 13,
19;"BCGG";AT 13,24;"F";AT 13,26;
"CEDGB"
1110 PRINT AT 12,2;"C";AT 12,5;"
F";AT 12,7;"G";AT 12,10;"G";AT 1
2,13;"C";AT 12,16;"B";AT 12,20;"
EGF";AT 12,26;"C";AT 12,28;"BE"
1120 PRINT AT 11,2;"C";AT 11,7;"
G";AT 11,10;"B";AT 11,13;"C";AT
11,21;"B";AT 11,26;"C"
1130 PRINT AT 10,2;"B";AT 10,7;"
G";AT 10,13;"C";AT 10,26;"B"
1140 PRINT AT 9,7;"G";AT 9,13;"C
"
1160 PRINT AT 8,7;"F";AT 8,13;"B
"
1161 INK 7: BRIGHT 0
1165 DATA 0,112,248,248,255,255,
127,15
1240 RESTORE 1165: FOR n=0 TO 7
1250 READ a: POKE USR "i"+n,a
1260 NEXT n
1270 DATA 7,1,50,116,255,255,255
,6
1350 FOR n=0 TO 7
1360 READ a: POKE USR "j"+n,a
1370 NEXT n
1380 DATA 248
1390 DATA 32
1400 DATA 64
1410 DATA 128
1420 DATA 255
1430 DATA 248
1440 DATA 240
1450 DATA BIN 0
1460 FOR n=0 TO 7
1470 READ a: POKE USR "k"+n,a
1480 NEXT n
1490 LET py=0
1500 LET px=0: LET k=0
1510 LET by=0: LET bx=0
1520 REM      start game
1525 INPUT "How many chances ?";
c
1530 IF px>0 THEN PRINT AT py,px
-1;" "
1540 PRINT AT py,px;"IJK"
1541 IF ATTR (py,px+3)=2 THEN LE
T k=k+1
1542 BEEP .001,10: BEEP .002,30:
 BEEP .001,55
1543 IF k>=c THEN GO TO 4000
1560 IF px>=29 THEN LET py=py+1
1570 IF py>=21 AND px>=29 THEN G
O TO 3000
1575 IF px>=29 THEN PRINT AT py-
1,28;"  "
1580 IF px>=29 THEN LET px=0
1582 LET px=px+1
1590 LET a$=INKEY$
1600 IF INKEY$="" THEN GO TO 153
0
1610 REM do bombs
1611 BEEP .004,0: BEEP .003,2: B
EEP .002,4: BEEP .002,6: BEEP .0
02,10: BEEP .002,12: BEEP .002,2
0
1620 IF py>=20 THEN LET by=21
1630 IF px<31 THEN LET bx=px+1
1640 IF px>=32 THEN LET bx=32
1645 IF py<=20 THEN LET by=py
1660 IF by=21 THEN PRINT AT 21,b
x; INK 2;"H"
1670 IF by=21 THEN GO TO 2000
1680 IF by>1 THEN PRINT AT by-1,
bx;" ": PRINT AT by,bx;"A"
1681 BEEP .001,60-by
1690 LET by=by+1
1700 IF py=21 AND px>=29 THEN GO
 TO 3000
1701 PRINT AT py,px-1;" "
1702 PRINT AT py,px;"IJK"
1703 IF px>28 THEN PRINT AT py,2
8;"  "
1704 IF ATTR (py,px+4)=2 THEN LE
T k=k+1
1705 IF k>=c THEN GO TO 4000
1706 IF px=29 THEN PRINT AT py,2
9;"  "
1710 IF px>28 THEN LET py=py+1
1720 IF px>29 THEN LET px=0
1730 LET px=px+1
1750 GO TO 1650
2000 REM
2001 PRINT AT 20,bx;" "
2002 BEEP .01,0: BEEP .02,50
2010 GO TO 1530
3000 REM End - Survived
3001 IF c<=hc THEN LET hc=c
3010 PRINT AT 0,0;"A safe landin
g.                  You had ";c;"
 chances and bumped    into ";k;
" buildings !!!"''"Press any key
to re-run."
3011 PRINT '"The lowest number o
f chances    needed so far,is ";
hc
3020 IF INKEY$="" THEN GO TO 302
0
3021 RESTORE 1165
3030 GO TO 1030
4000 REM End - crashed
4001 IF k=c AND py>=20 AND px>=2
9 THEN GO TO 3000
4010 IF px<=28 THEN PRINT AT py,
px+3;" "
4020 LET xc=8*(px+3): LET yc=8*(
21-py)
4030 FOR n=0 TO 10
4040 PLOT INK INT (RND*7)+1;xc,y
c
4041 DRAW INK INT (RND*7)+1;INT
(RND*10+1),INT (RND*10+1): PLOT
INK INT (RND*7)+1;xc,yc: DRAW IN
K INT (RND*7)+1;INT (RND*-10+1),
INT (RND*10+1)
4042 BORDER RND*7
4043 PLOT INK INT (RND*7+1);xc,y
c: DRAW INK INT (RND*7+1);RND*-1
0,RND*-10: PLOT xc,yc: DRAW INK
INT (RND*7+1);RND*10,RND*-10
4050 BEEP .01,RND*70-20: NEXT n
4060 NEXT n
4100 PRINT AT 0,0;"Bad luck,you
hit a tower block  and blew up "
;INT (RND*500)+10;" people!!!"
4101 PRINT "You had ";c;" chance
s,try a few      more next time !
!!"
4102 PRINT ''"Press any key to h
ave another    massacre !!!"
4110 IF INKEY$="" THEN GO TO 411
0
4111 RESTORE 1165
4120 GO TO 1030
6000 REM
        LARGE CHARACTER
        INTRODUCTION FOR
        USE WITH THE "PSION"
        HORIZONS CASSETE
        MACHINE CODE ROUTINE.
7000 CLEAR 32255: LOAD "mc"CODE
32255,300
7010 GO TO 9250
9090 LET xx=(256-8*xs*LEN p$)/2
9100 LET i=23306
9110 POKE i,xx
9120 POKE i+1,yy
9130 POKE i+2,xs
9140 POKE i+3,ys
9150 POKE i+4,8
9160 LET i=i+4
9170 LET w=LEN p$
9180 FOR n=1 TO w
9190 POKE i+n,CODE p$(n)
9200 NEXT n
9210 POKE i+w+1,255
```

(continued on page 165)


EXCLUSIVELY
AT
JOHN MENZIES
FROM CRL
ESCAPE FROM MANHATTAN
TEN 1K GAMES
ALIEN RAIN & OUTRIDER
J.D. ARCADES
FOR THE 16K ZX-81
ONLY £3-50p EACH

(listing continued from page 162)

```
9220 LET y=USR 32256
9230 RETURN
9250 OVER 0: PAPER 7: BORDER 2:
FLASH 0: INVERSE 0: BRIGHT 1: IN
K 1: CLS
9260 LET p$="© Robert Newton": L
ET yy=1
9270 LET xs=2: LET ys=3
9280 GO SUB 9090
9290 LET yy=60: LET p$="BLITZ":
FLASH 0: INK 2: LET xs=6: LET ys
=7: GO SUB 9090
9300 FLASH 0: INK 0: LET p$="Pre
ss any key to continue": LET xs=
1: LET ys=3: LET yy=166: GO SUB
9090
9310 PAUSE 0
9320 RUN
```

Juggler

J Charlesworth,
Kings-Lynn,
Norfolk.

SPECTRUM

THE OBJECT of this game, for the 16 or 48K ZX Spectrum, is to keep the balls which are bouncing around the screen from hitting the bottom of the screen. To do this, you move a bat back and forth across the bottom of the screen, trying to make the balls land on it so they can rebound upwards.

At first there is just one ball, but every 25 seconds another ball is added and your points, displayed in the top right-hand corner, go up in steps of however many balls there are. All the controls are printed by the computer on running the program.

For speed, I have written all the moving graphics section in machine code. This is stored in the data statements from line 9000 onwards, which the computer will check for errors with a checksum when it is run.

```
   1 BORDER 0: PAPER 0: INK 7
  10 GO TO 9000
  20 LET a$="                JUGGLER
        ": LET x=10: GO SUB
 200
  30 LET a$="    5 <-
   ->8       ": LET x=12: GO SUB
 200
  40 LET a$="   H=HOLD
   S=START   ": LET x=14: GO SUB
 200: GO TO 300
 200 FOR a=1 TO LEN a$: PRINT AT
x,0; BRIGHT 1;a$(LEN a$-a+1 TO
): BEEP .01,a+x: NEXT a: RETURN
 300 FOR a=1 TO 10: POKE 32346+4
*a,INT (RND*6)+3: POKE 32347+4*a
,INT (RND*20)+2: POKE 32348+4*a,
1-(2 AND RND>.5): POKE 32349+4*a
,1-(2 AND RND>.5): NEXT a
 310 LET a$="               PRESS S
        ": LET x=21: GO SUB
 200
 320 GO SUB 500
 330 CLS : PRINT AT 0,0;: LET l=
USR 32000
 340 LET r=0: LET p=0: GO SUB 40
0
 350 IF INKEY$="h" THEN GO SUB 5
00
 360 IF PEEK 23673>=5 THEN GO SU
B 400
 380 LET p=p+r: PRINT AT 0,27; P
APER 1;p; PAPER 0: LET l=USR 325
27: IF PEEK 23296<>99 THEN GO TO
 350
 390 GO TO 300
 400 POKE 23672,0: POKE 23673,0:
 LET r=r+(1 AND r<>10): POKE 325
31,r: POKE 32575,r: POKE 32578,3
0-2*r: PRINT AT 0,1; PAPER 1:"RO
UND ";r;AT 0,20;"POINTS ";p: RET
URN
 500 LET t=PEEK 23672: LET t1=PE
EK 23673
 510 IF INKEY$<>"s" THEN GO TO 5
10
 520 POKE 23672,t: POKE 23673,t1
: RETURN
9000 DATA 62,17,215,62,1,215,62,
6,215,62,6,215,6,21,62,22,215,16
0,215,62,0,215,62,32,215,62,22,2
15,120,215,62,31,215,62,32,215,1
6,-24,33,175,90,54,176,92,6,3,54
,87,35,16,-5
9010 DATA 201
9020 DATA 62,0,50,129,92,1,254,2
39,237,120,203,87,32,14,58,176,9
2,254,186,40,7,62,1,50,129,92,24
,24,1,254,247,237,120,203,103,32
,14,58,176,92,254,161,40,7,62,25
5,50,129,92,24,1,201
9030 DATA 58,129,92,254,1,32,16,
42,176,92,54,7,35,35,35,54,87,43
,43,34,176,92,201,42,176,92,43,5
4,87,34,176,92,35,35,35,54,7,201
9050 DATA 62,22,215,42,0,91,125,
215,124,215,62,16,215,62,7,215,6
2,32,215,237,91,2,91,125,181,71,
124,130,95,205,244,126,254,7,32,
23,33,0,91,112,35,115,62,22,215,
120
9060 DATA 215,123,215,62,16,215,
62,4,215,62,144,215,201,33,0,91,
58,2,91,134,71,35,94,205,244,126
,254,7,32,10,58,3,91,237,68,50,3
,91,24,39,33,0,91,70,35,58,3,91,
134,95,205,244,126,254,7
9070 DATA 32,10,58,2,91,237,68,5
0,2,91,24,12,33,2,91,126,237,68,
119,35,126,237,68,119,33,0,91,58
,2,91,134,119,35,58,3,91,134,119
,43,70,35,94,62,22,215,120,215,1
23,215,62,16
9080 DATA 215,62,4,215,62,144,21
5,33,0,1,17,20,0,205,181,3,201
9081 DATA 193,225,6,10,197,33,50
,0,6,0,197,229,17,4,0,205,181,3,
225,193,35,16,-13,193,16,-22,62,
99,50,0,91,201
9090 CLEAR 31999: LET a$="
   PLEASE WAIT               ": LET
 x=10: GO SUB 200
9095 LET t=0: FOR a=32000 TO 323
42: READ b: LET t=t+b: POKE a,b:
 NEXT a: IF t<>31720 THEN GO TO
9999
9100 RESTORE 9105: LET t=0: FOR
a=32500 TO 32593: READ b: LET t=
t+b: POKE a,b: NEXT a: IF t<>105
80 THEN GO TO 9999
9105 DATA 197,213,229,213,62,0,1
84,40,9,17,32,0,33,0,88,25,16,-5
,209,22,0,25,126,225,209,193,201
9110 DATA 33,94,126,6,1,197,229,
17,0,91,237,160,237,160,237,160,
237,160
9120 DATA 205,142,125,225,17,0,9
1,235,126,254,21,202,65,126,237,
160,237,160,237,160,237,160,235,
193,16,-39
9130 DATA 205,52,125,6,2,197,6,3
0,197,6,0,16,-2,193,16,-6,205,52
,125,193,16,-17,201
9140 RESTORE 9140: FOR a=0 TO 7:
 READ b: POKE USR "a"+a,b: NEXT
a: DATA 60,126,255,255,255,255,1
26,60
9150 GO TO 20
9999 PRINT AT 10,7; FLASH 1;"
DATA ERROR     ": STOP
```

Sound analysis

Predrag Bogdanovic,
Belgrade,
Yugoslavia.

ZX-81

THIS MACHINE-CODE program for the ZX-81 draws graphics illustrating sound. Sound is fed in on the Ear socket. To Load program create a Rem line 45 characters long. Use any hexloader to enter the code. The program is executed by RAND USR 16526. If you want the computer to draw one graphic and then return to Basic type:

POKE 16551,192(N/L)
POKE 16552,0(N/L)
POKE 16553,0(N/L)

or else the computer will clear display and draw again. The program returns to Basic when is pressed any key. The Subroutine at address 4082h — 16514 — gives — in C register — the frequency of the tone on the ear socket.

```
4082: 01 00 ff
      db fe
      3c
      20 01
      0c
      10 f8
      c9
408e: 16 00
      cd 82 40
      2a 25 40
      2c
      c0
      41
4099: 4a
      cb 38
      cb 38
      d5
      cd b2 0b
      d1
      14
      d5
      cb 72
      c4 2a 0a
      d1
      cb b2
      18 e1
```

Sub hunt

Jason Bumford,
Hanham,
Bristol,

VIC-20

SUB HUNT runs in an unexpanded Vic-20. It shows a minesweeper on the sea's surface, which moves left and right under machine-code control, while the rest of the Basic program controls submarines passing at random depths and directions. The minesweeper can drop depth charges from the bow and stern and the submarines will randomly retaliate with torpedos. Each sub sunk scores 10 points, and a deliberately wasted depth charge losses two points. A torpedo strike wipes our your score completely. The waste bomb key enables players to detonate depth charges in order to launch another if he has missed. User defined graphics are extensively used. When typing in the program ensure that no unnecessary spaces are left, because the whole memory is needed.

```
 1 POKE36878,15
 6 POKE55,18:POKE56,28
 10 PRINT"[clr][down][down]WAIT":LL=0
 30 FORA=7168TO7679:POKEA,PEEK(A+25600):NEXT
 50 FORA=7432TO7503:READB
 70 POKEA,B:NEXTA
 81 GOSUB800:POKE0,197:POKE1,0:POKE673,0:POKE674,11:POKE675,33:POKE676,34:GOTO11
00
 90 DATA3,1,7,23,255,127,63,31,192,128,224,232,255,254,252,248
 110 DATA1,1,5,31,63,63,63,31,224,224,224,254,255,255,255,254
 130 DATA255,0,0,0,0,0,0,0,0,0,42,28,28,42,0,0,8,28,28,28,60,254,254,124
 137 DATA0,1,30,32,67,68,137,137,240,12,228,18,17,145,81,81
 138 DATAAC,A2,02,A9,20,99,2B,1E,A9,20,99,2C,1E,A2,00,A1,00,CD,A3,02,D0,07,C0,02
,F0,03
 139 DATA88,A1,00,CD,A4,02,D0,05,C0,14,F0,01,C8,A9,21,99,2B,1E,A9,22,99,2C,1E,8C
,A2,02,60
 140 CLR:POKE36879,10:POKE36869,255:PRINT"[clr][down][down][rvs]/////////////////////////"
 141 PRINT"[home][down][down]                    ":SYS680
 143 A$(0)="2281223121522152215121912231225122822282228 3"
 145 FORA=1TO50STEP4:B=VAL(MID$(A$(0),A,3)):C=VAL(MID$(A$(0),A+3,1)):E=50:IFC=2T
HENE=100
 146 IFC=3THENE=200
 147 POKE36875,B:FORD=1TOE:NEXTD:POKE36875,0:NEXT
 150 CLR:V=36875:SS=8185
 160 X=7834:L=X
 170 GOSUB500:TI$="000000"
 180 GET A$:SYS680
 181 PRINT"[home][right][right][right][right][right][right][right][right][right][right][right][right][right]TIME "MID$(TI$,4,1)","RIGHT$(TI$,2)
 182 Z0=INT(RND(8)*21):IFZ0=3THENGOTO930
 183 IFTI$>"000200"THENFORA=255TO128STEP-.1:POKEV+1,A:NEXT:POKEV+1,0:GOTO1000
 184 IFAZ=-1THENIFX=L+(F*22)-23THENPOKEX+2,32:POKEX+1,32:GOSUB500
 185 IFLL=0THENIFA$=","THENLL=5:KK=0:GOSUB900:GOSUB700:POKEH,32:H=H+44
 186 IFLL=0THENIFA$="."THENLL=5:GOSUB700:KK=3:GOSUB900:GOSUB700:POKEH,32:H=H+44
 195 SYS680:IFLL<>5THEN230
 200 IFA$="/"THENLL=0:SC=SC-2:POKEH,32:FORI9=1TO30:POKEV+2,210:NEXT:POKEV+2,0
 230 POKEX,35:POKEX+1,36:POKEX-1,32:POKEX+2,32
 240 SYS680:X=X+AZ:IFX=L+(F*22)+21THEN POKEX,32:POKEX-1,32:GOSUB500 -
 245 SYS680:POKEV+1,240:POKEV+1,0
 246 IFLL=5THENH=H+22:POKEH,38:IFPEEK(H-1)<>32ORPEEK(H+1)<>32THENPOKEH-22,32:GOS
UB600
 247 IFLL=5THENIFH=<8120THENPOKEH-22,32
```

(continued on page 167)

Organisation

Andrew Dixon-Symes
West Croydon,
Surrey.

ORIC

THIS PROGRAM, for any size of Oric, turns the machine into a three-voice organ. It also shows how the play commands can be used to turn the certain voices on and off. The instructions are included in the program, and stay on screen while the program is running.

The second short program for Oric, demonstrates the high-resolution graphics of the machine whilst using the pattern command to give the lines being drawn a lace effect.

(continued from page 165)

```
248 IFLL=5THENIFH=>8120THENLL=0:POKEH,32:POKEH-22,32
250 GOTO180
500 X=L:F=INT(RND(2)*12):AZ=INT(RND(3)*2):IFAZ=1THENAZ=-1
505 IFAZ=0THENAZ=1
510 X=X+(F*22):IFAZ=-1THENX=X-3
520 RETURN
600 POKEV+2,200:O=32
610 FORJJ=1TO10:POKEV-10,36:FORI9=1TO60:NEXT:POKEV-10,38:SYS680
611 FORI9=1TO60:NEXT:NEXT:POKEV+2,0:POKEX+2,0:POKEX-1,0:POKEX+1,0:POKEX,0
620 IFAZ=1THENLL=0:POKEH,0:POKEH-22,0:SC=SC+10:GOSUB500:GOSUB700:GOTO630
621 IFAZ=-1THENLL=0:POKEH,0:POKEH-22,0:SC=SC+10:GOSUB500:GOSUB700
630 POKESS,39:SS=SS-1:GOTO180
700 PRINT"■■SCORE     ■■■■■"SC:RETURN
800 FORHH=680TO680+52:READ ZZ$
810 GG=ASC(ZZ$)-48:II=ASC(RIGHT$(ZZ$,1))-48
830 IFGG>16THENGG=GG-7
840 IFII>16THENII=II-7
850 POKEHH,GG*16+II
860 NEXT HH:RETURN
900 FORI9=7724TO7724+21
910 IFPEEK(I9+1)<>32THENH=I9:H=H+KK:POKEH,38:RETURN
920 NEXT:RETURN
930 I9=0:OO=250:FORXX=X-44TO7746STEP-22
935 SYS680
940 POKEXX,42:POKEV,170:POKEV+2,OO:OO=OO-8:POKEXX+22,32
950 IFPEEK(XX-22)=33ORPEEK(XX-22)=34THENI9=5
960 IFI9=5THENSC=0:POKEXX-22,40:POKEXX-21,41:FORJJ=255TO128STEP-.5:POKEV,JJ:NEX
T
961 IFI9=5THENPOKEXX-22,32:POKEXX-21,32:POKEV+2,0:POKEV,0:I9=0
970 NEXT:POKEV+2,0:POKEV,0
980 POKEXX,32:PRINT"■■■■■////////////////////////":GOSUB700:GOTO183
1000 POKEV+4,27:POKEV-6,240
1010 PRINT"■■YOU SCORED"SC" POINTS":PRINT"■ANOTHER GO"
1030 PRINT"■■(Y/N)■"
1040 GETA$:IFA$=""THEN1040
1050 IFA$="Y"THEN140
1060 IFA$="N"THENEND
1070 GOTO1040
1100 PRINT"■■■■   THIS IS SUB HUNT ■"
1110 PRINT"■ YOU ARE A SHIP TRYINGTO STOP ENEMY SUBS    REACHING THEIR TARGET"
1115 PRINT"■ BUT THEY FIRE BACK !"
1116 PRINT"■ YOU HAVE 2 MINUTES"
1120 PRINT"■■YOUR CONTROLS ARE;■"
1130 PRINT"■■Z■ FOR LEFT":PRINT"■■C■ FOR RIGHT"
1140 PRINT"■■.■ AND ■.■ FOR FIRE":PRINT"■■/■ TO WASTE BOMB"
1150 PRINT"■■ HIT ANY KEY TO PLAY "
1160 GETA$:IFA$=""THEN1160
1170 GOTO140
```

```
10 REM **** Three Voice Synthesizer ****
20 REM ****    Copyright12/3/1983   ****
30 REM ****    Andrew Dixon-Symes   ****
40 GOSUB 520
50 :
60 PLAY7,0,0,0
70 K$=KEY$
80 :
90 REM   ****  VOICE ONE  ****
100 :
110 IFK$="1"THENMUSIC1,2,1,4
120 IFK$="2"THENMUSIC1,2,3,4
130 IFK$="3"THENMUSIC1,2,5,4
140 IFK$="4"THENMUSIC1,2,6,4
150 IFK$="5"THENMUSIC1,2,8,4
160 IFK$="6"THENMUSIC1,2,10,4
170 IFK$="7"THENMUSIC1,2,12,4
180 :
190 REM   ****  VOICE TWO  ****
200 :
210 IFK$="Q"THENMUSIC2,3,1,4
220 IFK$="W"THENMUSIC2,3,3,4
230 IFK$="E"THENMUSIC2,3,5,4
240 IFK$="R"THENMUSIC2,3,6,4
250 IFK$="T"THENMUSIC2,3,8,4
260 IFK$="Y"THENMUSIC2,3,10,4
270 IFK$="U"THENMUSIC2,3,12,4
280 :
290 REM   ****  VOICE THREE  ****
300 :
310 IFK$="A"THENMUSIC3,4,1,4
320 IFK$="S"THENMUSIC3,4,3,4
330 IFK$="D"THENMUSIC3,4,5,4
340 IFK$="F"THENMUSIC3,4,6,4
350 IFK$="G"THENMUSIC3,4,8,4
360 IFK$="H"THENMUSIC3,4,10,4
370 IFK$="J"THENMUSIC3,4,12,4
380 :
390 REM   ****  CONTROL PANEL  ****
400 :
410 IFK$="Z"THENPLAY0,0,0,0
420 IFK$="X"THENPLAY1,0,0,0
430 IFK$="C"THENPLAY2,0,0,0
440 IFK$="V"THENPLAY4,0,0,0
450 IFK$="B"THENPLAY3,0,0,0
460 IFK$="N"THENPLAY5,0,0,0
470 IFK$="M"THENPLAY6,0,0,0
480 IFK$="L"THENPLAY7,0,0,0
490 IFK$=" "THENPLAY0,0,0,0:STOP
500 GOTO70
510 :
520 REM   ****  INSTRUCTIONS  ****
530 :
540 CLS
550 PLOT10,2,"THREE VOICE SYNTHESIZER"
560 PLOT10,3,"----- ----- -----------"
570 A$=CHR$(96)+"Andrew Dixon-Symes 1983"
580 PLOT7,4,A$
590 PLOT8,7,"*** INSTRUCTIONS ***"
600 PLOT1,9,"VOICE-1:Numbers 1-7 In Octave 2"
610 PLOT1,10,"VOICE-2:Letters Q-U In Octave 3"
620 PLOT1,11,"VOICE-3:Letters A-J In Octave 4"
630 PLOT4,13,"The letters on the bottom row"
640 PLOT4,14,"act as on-off switches for"
650 PLOT4,15,"the different combinations of"
660 PLOT4,16,"the three sound channels."
670 PLOT5,17,"Z=ALL OFF,X=1 ON,C=2 ON,"
680 PLOT5,19,"V=3 ON,B=1&2 ON,N=1&3 ON,"
690 PLOT5,21,"M=2&3 ON,L=1,2&3 ON."
700 PLOT1,23,"TO STOP THE PROGRAM PRESS THE SPACE BAR"
710 RETURN
```

```
10 REM ****  ORIC PATTERN  ****
20 REM **** Copyright 1983 ****
30 REM ****   Andrew D-S   ****
40 :
50 HIRES
60 :
70 A=INT(RND(1)*90)+100
80 B=INT(RND(1)*60)
90 C=INT(RND(1)*3)-4
100 :
110 REPEAT:Z=Z+1
120 :
130 FOR R=A TO B STEP C
140 :   CURSET R,R,3
150 :   DRAW 0,199-2*R,1
160 :   DRAW 239-2*R,0,1
170 :   DRAW 0,-199+2*R,1
180 :   DRAW -239+2*R,0,1
190 :   PATTERN INT(RND(1)*127)+127
200 NEXT R
210 :
220 UNTIL Z=3
230 WAIT 200
240 Z=0:GOTO 50
```

Bubbles

D J Berry,
Rogerstone,
Gwent.

DRAGON

BUBBLES IS A game written entirely in Dragon Colour Basic. Listing 1 is the game itself, listing 2 is a separate instructions program. You can read the instructions now to get an idea of how to play the game.

The program relies heavily on the speed of Dragon Basic graphics commands for its fluidity. Circles are drawn, un-drawn and moved to provide targets for a laser gun which is initially drawn with the Draw command and subsequently moved with Put and Get. Because I was limited to Inkey$ for movement control the gun moves continuously — key presses modify rather than initiate movement. The only exception to this is in line 60 where Peeking location 65288 reads keyboard-matrix columns to detect when the gun is to be fired.

The graphics commands most often used in the program are: Circle, Draw, Put and Get. Circle, as the command name implies, draws a circular form on the screen centred at X,Y and with defined radius, colour and height to width ratio — unity for a circle, other values for ellipses. The resolution of the circle is far better in the highest graphics mode

(continued on next page)

```
10 'LISTING 2 -- INSTRUCTIONS
20 '##########################
30 CLS
40 PRINT STRING$(32,"=");
50 PRINT"** WELCOME TO DRAGON BUBBLES **"
60 PRINT STRING$(32,"=")
70 PRINT"A DEADLY VIRUS IS FLOATING DOWN"
80 PRINT"FROM THE SKIES INSIDE  GOSSAMER"
90 PRINT"BUBBLES.  YOUR  TASK  AS  LASER"
100 PRINT"COMMANDER IS TO SHOOT  ALL  THE"
110 PRINT"BUBBLES BEFORE THEY  REACH  THE"
120 PRINT"GROUND. ONLY ONE HAS  TO  TOUCH"
130 PRINT"DOWN FOR THE WHOLE WORLD  TO BE"
140 PRINT"WIPED OUT."
150 IF INKEY$="" GOTO 150
160 CLS
170 PRINT STRING$(32,"=");
180 PRINT"** WELCOME TO DRAGON BUBBLES **"
190 PRINT STRING$(32,"=")
200 PRINT"UNFORTUNATELY EACH TIME  ONE IS"
210 PRINT"HIT TWO  THINGS  HAPPEN:  FIRST"
220 PRINT"THAT BUBBLE GETS  SMALLER, THEN"
230 PRINT"IT BEGINS TO FALL FASTER."
240 PRINT"ONE OTHER PROBLEM IS THAT LASER"
250 PRINT"CANNON CAN'T FIRE THROUGH CLOUD":PRINT
260 PRINT"ALSO,  AS  TIME  GOES  ON,  THE"
270 PRINT"SKIN  OF  THE  BUBBLES  BECOMES"
280 PRINT"MUCH  TOUGHER,  REQUIRING  MUCH"
290 PRINT"MORE ACCURATE SHOOTING."
300 IF INKEY$="" GOTO 300
310 CLS
320 PRINT STRING$(32,"=");
330 PRINT"** WELCOME TO DRAGON BUBBLES **"
340 PRINT STRING$(32,"=")
350 PRINT"TO CONTROL THE  CANNON USE  THE"
360 PRINT"FOLLOWING KEYS:"
370 PRINT STRING$(03," ");"< -- TRAVERSE LEFT FAST"
380 PRINT STRING$(03," ");"> -- TRAVERSE RIGHT FAST"
390 PRINT STRING$(03," ");"M -- TRAVERSE LEFT SLOW"
400 PRINT STRING$(03," ");"/ -- TRAVERSE RIGHT SLOW"
410 PRINT STRING$(03," ");"(SPACE BAR) -- FIRE CANNON"
420 IF INKEY$="" GOTO 420
430 CLS
440 PRINT STRING$(32,"=");
450 PRINT"** WELCOME TO DRAGON BUBBLES **"
460 PRINT STRING$(32,"=")
470 PRINT"THE GAME SCORES  ARE  DISPLAYED"
480 PRINT"AT THE TOP RIGHT OF THE  SCREEN"
490 PRINT"IN THE  SEQUENCE: GAME;  NUMBER"
500 PRINT"OF BUBBLES LEFT  IN  THIS GAME;"
510 PRINT"SCORE (DEPENDS  ON  RADIUS  AND"
520 PRINT"ACCURACY); AND TOTAL  NUMBER OF"
530 PRINT"BUBBLES DESTROYED."
540 IF INKEY$="" GOTO 540
550 FOR A=8 TO 1 STEP -1
560 CLS(A)
570 TIMER=0
580 PRINT @160," "
590 PRINT @170,"GOOD LUCK"
600 IF TIMER<100 GOTO 600
610 NEXT
```

```
10 'LISTING 1 -- BUBBLES -- D.BERRY
20 '*******************************
30 CLS8
40 XGUN=6:MOVE=-5:HIT=0:DAMAGE=0
50 QUANTITY=5:RAD=15:ACC=1:GAME=1
60 DIM MB(8,8),X(QU),Y(QU),VEL(QU),RAD(QU),GU(10,12),BLANK(10,12),Q$(4),CLOUD(2
6,8),BCLOUD(26,8)
70 REM PARAMETERS
80 C0=65280:C1=223:C2=-5:C3=+5:C4=-2:C5=+2:C6=178:C7=190:C8=240:C9=157:K0=158:K1
=150:K2=26
90 Q$(1)="BM206,2;"
100 Q$(2)="BM211,2;"
110 Q$(3)="BM216,2;"
120 Q$(4)="BM221,2;"
130 PMODE4:SCREEN1,0:COLOR 0,1:PCLS
140 GET(0,0)-(26,8),BCLOUD,G
150 DRAW"BM5,5;F2R16E2U1H3L6G1L4H4L5G4D2R6"
160 PAINT(10,6)
170 GET(0,0)-(26,8),CLOUD,G
180 PUT(0,0)-(26,8),BC,PSET
190 GET(20,179)-(28,187),MB,G
200 LINE(0,0)-(255,191),PSET,B
210 PLAY"T10;ABCDEDCBA;T255"
220 TTL=QU+1
230 GOSUB 310
240 GOSUB 420
250 GOSUB 1170
260 GOSUB 1040
270 GOSUB 650
280 GOSUB 470
290 IF TTL>1 GOTO 270
300 IF TTL=1 THEN GA=GA+1:RAD=RAD*0.75:MOVE=-5:XGUN=3:ACC=ACC-0.25:IF ACC<0.5 TH
EN ACC=0.5:PCLS:GOTO 200 ELSE PCLS:GOTO 200 ELSE PLAY"T5;O3DDDO2B":PRINT(2,190):
CLS(GA):PRINT"YOU LOST":PRINT"YOU SCORED  ";PRINT FIX(DA);" POINTS":PRINT HIT;"D
ESTROYED":END
310 REM DCIRC:DRAW CIRCLES
320 XCLOUD=0
330 FOR Q=1 TO QU
340 X(Q)=RND(255-2*RAD)+RAD
350 Y(Q)=RND(48-RAD)+RAD
360 RAD(Q)=RAD
370 VEL(Q)=15/RAD
380 IF X(Q)>50 AND X(Q)<150 AND XCLOUD=0 THEN XCLOUD=X(Q)-12
390 NEXT Q
400 IF XCLOUD=0 THEN XCLOUD=175
410 RETURN
420 REM DGUN:DRAW GUN
430 DRAW"BM3,190;R09U1L09U1R09U1L09;BM7,186;U8R1D8"
440 GET(3,178)-(13,190),GUN,G
450 GET(20,174)-(30,186),BLANK,G
460 RETURN
470 REM MCIRC:MOVE CIRCLES
480 TIMER=0
490 PUT(XC,K1)-(XC+K2,K0),BC,PSET
500 XC=XC-(RND(3)-2)
510 PUT(XC,K1)-(XC+K2,K0),CL,AND
520 RN=RND(QU)
530 IF RAD(RN)<1 GOTO 630
540 CIRCLE(X(RN),Y(RN)),RAD(RN),1
550 PSET(X(RN),Y(RN))
560 Y(RN)=Y(RN)+VEL(RN)
570 IF Y(RN)>180-RAD(RN) GOTO 300
580 X(RN)=X(RN)+(RND(7)-4)
590 IF X(RN)<10 THEN X(RN)=10
600 IF X(RN)>243 THEN X(RN)=243
610 CIRCLE(X(RN),Y(RN)),RAD(RN),0
620 PSET(X(RN),Y(RN))
630 IF TIMER<16 THEN GOTO 630
640 RETURN:TIMER CONTROLS SMOOTH GUN MOVEMENT
650 REM MGUN:MOVE GUN
660 IF PEEK(C0)=C1 THEN PLAY"C":GOSUB 850
670 MG$=INKEY$
680 IF MG$="" GOTO 730
690 IF MG$="," THEN MOVE=C2
700 IF MG$="." THEN MOVE=C3
710 IF MG$="M" THEN MOVE=C4
720 IF MG$="/" THEN MOVE=C5
730 PUT(XGUN,C6)-(XGUN+10,C7),BLANK,PSET
740 XGUN=XGUN+MOVE
750 IF XGUN>C8 OR XGUN<C3 THEN MOVE=-MOVE
760 IF XGUN<0 THEN XGUN=6
770 PUT(XGUN,C6)-(XGUN+10,C7),GUN,PSET
780 RETURN
790 REM FIRE:FIRE GUN
800 TIMER=0
810 LINE(OF,C6)-(OF,YGUN),PSET
820 PLAY"D"
830 LINE(OF,C6)-(OF,YGUN),PRESET
840 RETURN
850 REM HIT? -- DRAW OUT
860 YMAX=0:HTEST=0:OF=XGUN+4
870 FOR Q=1 TO QU
880 IF RAD(Q)=0 GOTO 920
890 IF(OF+(RAD(Q)*ACC)<X(Q)) OR  (OF-(RAD(Q)*ACC))>X(Q)) GOTO 920
900 HTEST=1
910 IF Y(Q)>YMAX THEN YMAX=Y(Q):K=Q
920 NEXT
930 IF HTEST=0 THEN YGUN=1 ELSE YGUN=Y(K)
940 IF OF>XC THEN IF XG<XC+22 THEN IF YG<C9 THEN YG=K0:GOSUB 790:RETURN
950 GOSUB 790
960 IF YGUN=1 THEN RETURN
970 REM RUB OUT & REDRAW
980 CIRCLE(X(K),Y(K)),RAD(K),1
990 RAD(K)=FIX(RAD(K)/2)
1000 VEL(K)=VEL(K)*2:X(K)=X(K)+(RND(7)-4)
1010 IF RAD(K)>0 THEN CIRCLE(X(K),Y(K)),RAD(K),0 ELSE HIT=HIT+1:PRESET(X(K),Y(K)
):X(K)=0:TTL=TTL-1:GOSUB 1170
1020 DA=DA+(VEL(K)/ACC):GOSUB 1040
1030 RETURN
1040 REM DCOUNT:PRINT DAMAGE TALLY
1050 PUT(206,2)-(214,10),MB,PSET
1060 PUT(216,2)-(224,10),MB,PSET
1070 DX=DA:SCALE=1000
1080 FOR LOOP=1 TO 4
1090 AA$=Q$(LO)
1100 BB=FIX(DX/SCALE)
1110 GOSUB 1350
1120 DX=DX-BB*SCALE
1130 SCALE=SCALE/10
1140 NEXT
1150 PLAY"C"
1160 RETURN
1170 REM HCOUNT:HIT TALLY
1180 AA$="BM193,2;"
1190 PUT(193,2)-(201,10),MB,PSET
1200 BB=TTL-1
1210 GOSUB 1350
1220 AA$="BM181,2;"
1230 PUT(181,2)-(189,10),MB,PSET
1240 BB=GAME
1250 GOSUB 1350
1260 AA$="BM236,2;"
1270 PUT(236,2)-(244,10),MB,PSET
1280 BB=FIX(HIT/10)
1290 GOSUB 1350
1300 AA$="BM241,2;"
1310 BB=HIT-(FIX(HI/10))*10
1320 GOSUB 1350
1330 PLAY"ADA"
1340 RETURN
1350 REM PRINT:PRINT ON SCREEN
1360 ON BB GOTO 1380,1390,1400,1410,1420,1430,1440,1450,1460
1370 AB$="R3D7L3U7":GOTO 1470
1380 AB$="BM+3,0;D7":GOTO 1470
1390 AB$="R3D3L3D4R3":GOTO 1470
1400 AB$="R3D7L3R3U4L3":GOTO 1470
1410 AB$="D3R3U3D7":GOTO 1470
1420 AB$="R3L3D3R3D4L3":GOTO 1470
1430 AB$="R3L3D7R3U4L3":GOTO 1470
1440 AB$="R3D7":GOTO 1470
1450 AB$="R3D3L3U3;BM+0,+3;D4R3U4":GOTO 1470
1460 AB$="R3D3L3U3R3D7":GOTO 1470
1470 DRAW AA$+AB$
1480 RETURN
```

(continued from previous page)

PMode4. In the lower modes the circles are approximate to such an extent that with radii below about 15 their finned square shapes make useful gunsights. The Draw command is always followed by a string literal or variable which controls the movement of an imaginary cursor — up, down, left, right; plus diagonals, rotation, scaling and blank moves any number of screen points.

The gun and cloud are formed initially with the Draw command then moved around with Put and Get. The score digits are produced by concatenating strings containing draw instructions with ones containing blank move instructions then using the result as the argument for a Draw command.

Get copies graphical data from the screen and stores it in a predefined array. Put reverses the process. Put and Get are used in Bubbles to move the gun and cloud, the sequence being simply: Put blank sky where the gun is now; change the X co-ordinate of the gun; Put the gun in its new place. the cloud is moved in the same way.

The program is broken down into a series of subroutines starting with DCirc in line 310. Lines 10 to 220 perform the initial setting up, draw the screen, and cloud, set tally and score counters and set up a parameter list.

The arrays used by the program are as follows: MB stores a bit of blank sky used here and there to rub out charactèrs and so on, X and Y are circle centres, Vel is circle 'velocity'', Rad is radius, Gun has the drawn "gun" Put and Get from it, Blank is again blank sky — this time big enough to rub out the gun, and Cloud and BCloud are similar to Gun and Blank. It is important to note that Dragon Basic only recognises the first two letters of a variable name so that, for example, Bcloud and BC are the same variable. Lines 150 and 160 use Draw and Paint to fashion the nasty black cloud.

DCirc sets up each circles' variables: X,Y,Rad and Vel. It also ensures the cloud is directly in front of one of the bubbles. DGun draws the gun and stores it in array Gun.

MCIRC first moves the cloud then draws' out, moves and redraws a randomly chosen circle. Line 570 asks "has a bubble reached the ground?" then jumps to a line which terminates the program if true.

MGun scans the keyboard and jumps to Hit if the fire key is being pressed. Notice the extensive use of parameters in this often used routine. Fire simply draws the line of "laser light" from "gun" to "target". This is called from Hit which calculates whether a bubble was in the way of the shot. It uses the present Accuracy and Radius values to perform the calculation. This routine produces a parameter YGun to pass into Fire which then draws its line to the point XG,YG. Lines 970 onwards change the parameters of a hit bubble. Radius is halved velocity doubles and its centre jumps sideways.

DCount and HCount are respectively damage and hit tallies. They break the number passed to them into individual digits then use routine Print to display the values on the screen.

Worm squirm

J S Henry,
Cranleigh,
Surrey.

ATOM

THIS PROGRAM is called Worm and it runs on a fully expanded Acorn Atom in 4K. The

(continued on page 173)



DRAGON OWNERS
BARRELS OF FUN IN THE NEW
ANOTHER GREAT GAME FROM MICRODEAL – GUARANTEED TO KEEP YOU PLAYING FOR HOURS TRYING TO SAVE THE BEAUTY FROM THE BEAST. ROLLING BARRELS! KILLER FLAMES! LADDERS AND RAMPS TO NEGOTIATE IN THE BEST GAME EVER FOR THE DRAGON 32 HOME COMPUTER.
DONKEY KING
FROM TOM MIX
NEW
DONKEY KING
MICRODEAL
NEW
SPACE WAR
Defense
DRAGON INVADERS
ALCATRAZ II
Flipper
ESCAPE
SPACE MONOPOLY
MANSION ADVENTURE 1
Williamsburg ADVENTURE 3
ULTIMATE adventure 4
All Cassettes £8 each (including VAT & Postage)
AVAILABLE FROM DRAGON 32 DEALERS NATIONWIDE OR ORDER DIRECT FROM:
MICRODEAL
41 TRURO ROAD, ST. AUSTELL, CORNWALL PL25 5JE TEL 0726-67676
Send 1st Class Stamp for FREE Software Lists for Dragon and Tandy range of Computers.
AVAILABLE FROM SELECTED Boots & John Menzies STORES

A two-minute operation turns your BBC Micro into the heart of a word processor.

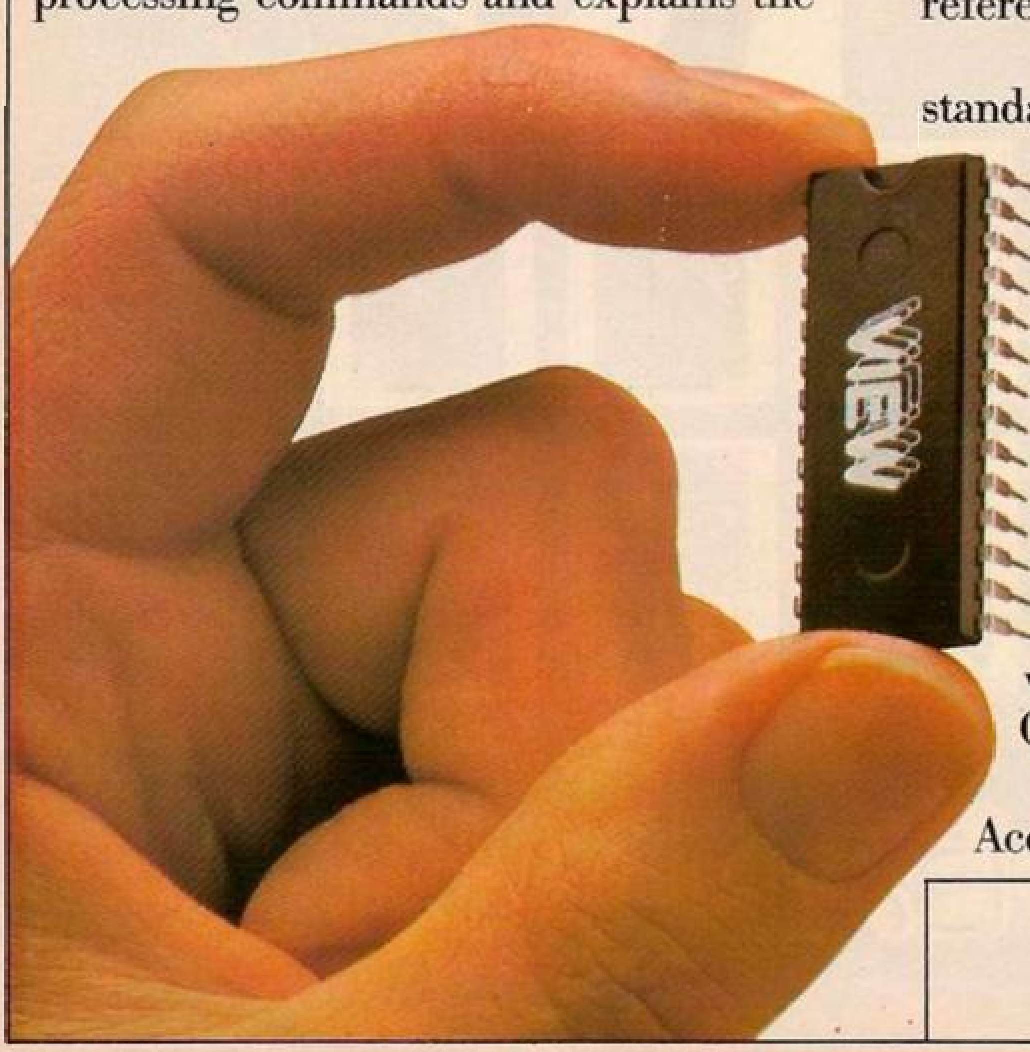
VIEW is a software program from Acornsoft (the software division of Acorn Computers Ltd., who designed and built the BBC Micro) that enables you to use your BBC Micro, together with a printer, as a fully operational word processor.

View is supplied as a Rom chip that can easily be fitted to your BBC Micro by your local dealer, in a painless two-minute operation.

Then, once installed, you only have to switch on and View is operating immediately. (You can easily switch back to normal computing with a single command.)

Also included in the View package are two special books: 'Into View,' that takes you by easy stages through all the word processing commands and explains the many ways in which View can help you, and the 'View Guide,' which provides a quick reference to all View facilities.





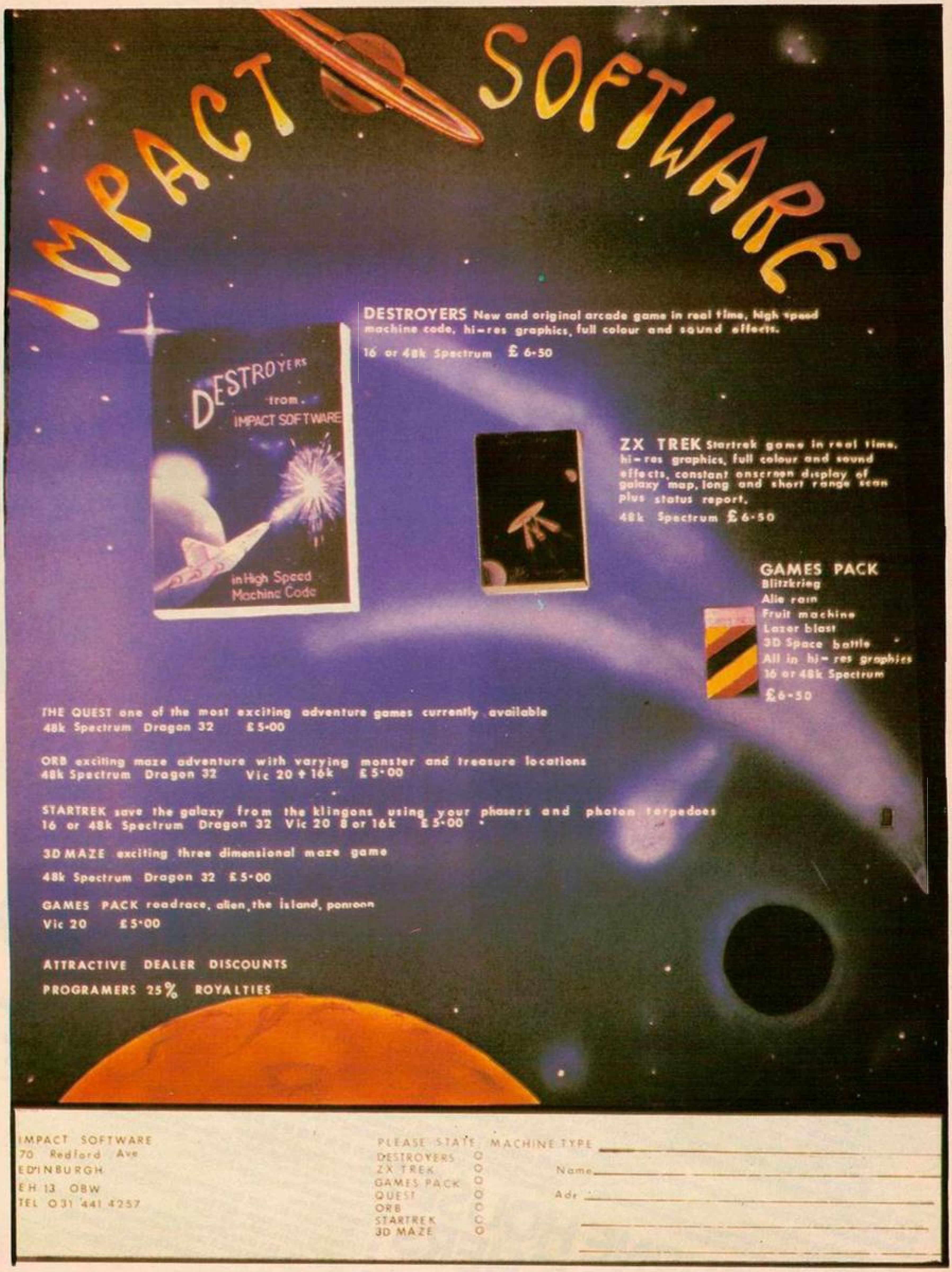
You'll find that View is, by any standards, a thoroughly professional system, yet still surprisingly simple for the beginner to master.

The 'Spark-Jet Printer' shown in the photograph is the ideal choice of printer for your word processing application. Extremely quiet, it offers high resolution graphics from monitor or T.V. screen and is available now from dealers.

If you'd like more information, write to Acornsoft, 4a Market Hill, Cambridge CB2 3NJ.

Or, for details of your local Acornsoft dealer, phone 01-200 0200.

ACORNSOFT


IMPACT SOFTWARE
DESTROYERS New and original arcade game in real time, high speed machine code, hi-res graphics, full colour and sound effects.
16 or 48k Spectrum £ 6·50
DESTROYERS from IMPACT SOFTWARE
in High Speed Machine Code
ZX TREK Startrek game in real time, hi-res graphics, full colour and sound effects, constant onscreen display of galaxy map, long and short range scan plus status report.
48k Spectrum £ 6·50
GAMES PACK
Blitzkrieg
Alie rain
Fruit machine
Lazer blast
3D Space battle
All in hi-res graphics
16 or 48k Spectrum
£6·50
THE QUEST one of the most exciting adventure games currently available
48k Spectrum Dragon 32 £ 5·00
ORB exciting maze adventure with varying monster and treasure locations
48k Spectrum Dragon 32 Vic 20 + 16k £ 5·00
STARTREK save the galaxy from the klingons using your phasers and photon torpedoes
16 or 48k Spectrum Dragon 32 Vic 20 8 or 16k £ 5·00
3D MAZE exciting three dimensional maze game
48k Spectrum Dragon 32 £ 5·00
GAMES PACK roadrace, alien, the island, pontoon
Vic 20 £ 5·00
ATTRACTIVE DEALER DISCOUNTS
PROGRAMERS 25% ROYALTIES
IMPACT SOFTWARE
70 Redford Ave
EDINBURGH
EH 13 OBW
TEL 031 441 4257
PLEASE STATE MACHINE TYPE
DESTROYERS
ZX TREK
GAMES PACK
QUEST
ORB
STARTREK
3D MAZE
Name
Adr



In a place forgotten by time, the beating of wings heralds an incarnation too horrifying to believe – Terror Daktil 4D. A game so terrifyingly real that you'll need all your courage just to remain at your 48K Spectrum screen.

As the dreaded prehistoric monsters swoop down, intent on your destruction, a battered pistol and marksmanship are your only defence.

You must fight for your life and as the sun sets, your chances of survival begin to slip away. For at night, you'll only see the gleam of their eyes!

Terror Daktil 4D – a game beyond your wildest dreams; not just 3-dimensional graphics reaching out of your Spectrum to engulf you, but also the 4th dimension of time that turns day into menacing night at an alarming rate.

Unbelievable thrills await those brave enough to enter the lost world of Terror Daktil 4D.

Two more super 48K Spectrum programs:

PENETRATOR "...immensely playable, yet very difficult and horribly addictive." – **Computer & Video Games.**

THE HOBBIT "The Hobbit is far superior to any other adventure game available for the Spectrum" – **Your Computer**
"A game by which future games will be judged." – **P.C.T.**

MELBOURNE HOUSE PUBLISHERS

Melbourne House Publishers YC5
Orders to: 131 Trafalgar Road, Greenwich, London SE 10
Correspondence to: Glebe Cottage, Station Road, Cheddington, Leighton Buzzard, BEDS LU7 7NA.

☐ Please send me your **free** Catalogue.

Please send me:
☐ Terror Daktil 4D – 48K Spectrum cassette – £6.95
☐ The Hobbit package – 48K Spectrum cassette, full colour instruction manual and Hobbit book – £14.95
☐ Penetrator – 48K state-of-the-art arcade game – £6.95
Please add 80p for post & pack.) I enclose cheque/money order
£ .... or debit my Access card No.
.... Expiry date ....
Signature ....
Name ....
Address ....
.... Postcode ....

Access orders on 24-hour ansaphone
(01) 858 7379

(continued from page 168)

object of the game is to eat the zeros and miss the dots. There are always two zeros on the screen and when you eat one, another one appears.

If you hit one of the dots a section of your tail is cut off and another dot appears. Dots also appear after you have eaten 3 zeros. If you run into your tail or the sides you will lose a point. The game ends when you either run out of tail or trap yourself in your tail. The dots move randomly one at a time and there are machine-code sound effects.

Use j to turn you left and k to turn you right. To master the turning always imagine yourself at the head of the worm looking the direction you are always travelling. Make sure also that you do not keep the button down too long or you will turn too far. Here is a breakdown of the program:

1-95 : set up screen and machine code
100-160 : move worm
1000-1030 : set up zero
1100-1120 : set up dots
1200-1250 : check if dead end or trapped
1290-1370 : game over routine
1500-1530 : move a dot at random
1999-end : instructions.

```
1GOS.r
2I=0;E=0
 5?#81=3;I=0;R=#3BF0;$R="A"? "
10?#E1=0;CLEAR0;S=1;IFH<IORH>9999;H=0
20MOVE0,0;DRAW63,0;DRAW63,47;DRAW0,47;DRAW0,0
30DIMAA21,EE20,VV5;P=#3B00;P.#21
40L=#B002;[;:VV0JSR#FE71;STY#80;RTS
50:VV1LDY#81;:VV2LDX#80
60:VV3DEX;BNEVV3
70STAL;EOR#4;DEY;BNEVV2;RTS;]
80P.$6;M=15
90FORG=1TOM;AAG=#8020+G;?AAG=-1;N.
91FORG=255TO1S.-4;?#80=G;LINKVV1;WAIT;N.
95GOS.a;GOS.a;?#81=20
100?AAM=162
110LINKVV0;I=?#80+32;?#B002=0
115GOS.x
120I=I+(I=CH"K")-(I=CH"J");I=(I+4)%4
130Q=AAM+R?I-64;IF?Q<>64;GOS.c
135IFT=1;T=0;G.100
140AA(M+1)=Q;?AA(M+1)=162;?AAM=-1
145?AA1=64
150FORG=1TOM;AAG=AA(G+1);N.
160?#80=Z*3;LINKVV1;G.110
1000aG=#8000+A.R.%480;IF?G<>64;G.a
1010?G=15;FORG=1TO10;?#B002=?#B002:7;N.
1020S=S+1;IFS%3=0;GOS.b
1030R.
1100bG=#8000+A.R.%480;IF?G<>64;G.b
1105E=E+1;EEE=G
1110?G=46;?#80=40;FORG=1TO10;LINKVV1;WAIT;N.
1120R.
1200cIF?Q=15;GOS.a;R.
1210IFAAM?1>64;IFAAM?-1>64;IFAAM?32>64;IFAAM?-32>64;G.d
1215T=0
1220IF?Q=46;GOS.e;IFM=0;G.d
1230FORG=0TO255S.36;?#80=G;LINKVV1;N.;T=1
1240IFRND%4=0;F.G=1TO10;?#80=RND;LINKVV1;N.;S=S-1;R.
1250R.
1290d?#81=2
1300CLEAR4;FORG=1TO200;?#B000=#F0;?#80=G;LINKVV1;?#B000=#D0;N.
1305P.$12"game over"'''"YOUR SCORE WAS"S'';IFH<S;H=S
1310P."HISCORE:        "H''
1320FORG=255TO0S.-8;?#80=G;LINKVV1;N.
1330?#81=20;FORG=1TO255S.3
1340?#80=G;LINKVV1;?#80=G-10;LINKVV1;?#80=G+10;LINKVV1
1350N.;P."PRESS ANY KEY TO RESTART"
1360?#80=RND;?#81=8;LINKVV1;LINKVV0;IF?#80<255;G.2
1370G.1360
1400e?AAM=64;FORG=1TO10
1410?#80=G;LINKVV1;?#80=255-G;LINKVV1;N.;M=M-1;F.
1500x0=A.R.%E+1
1510G=EE0+R.%2+R.%2*32
1520IF?G<>64;R.
1530?EE0=64;?G=46;EE0=G;R.
1999r
2000P.$12"***************WORM***************"
2010P.''"YOU ARE AT THE HEAD OF THE WORM."''"YOU MUST EAT THE "
2020P.""0'S.IF YOU HIT THE DOTS YOU WILL LOSE PART OF YOU TAIL"
2030P.".MAKE SURE YOU DON'T RUN INTO YOUR TAIL OR THE WALLS OR"
2040P." YOU MIGHT TRAP YOURSELF "'
2050P."USE 'J' TO MOVE LEFT AND 'K' TO MOVE RIGHT"'
2060P.''"GOOD LUCK"'''"PRESS ANY KEY TO CONTINUE";LI.#FFE3
2070R.
```

Flight of Fancy

M J Parrot,
Stockport,
Cheshire.

BBC

THE GAME is for the Model B and is the traditional 501 down, finishing on a double or the bull. Lines 10,220 give the instructions for the game, ask the number of players and take in the names of the players. If there is only one, then player 2 is assigned the name Beeb (line 210) and the logical variable Beeb is set True.

After pressing the space bar (lines 230,240) the game can begin but we first have to draw the board. This is the most complicated part of the program because some trigonometry is used. Line 1170 first sets minimum and maximum values for X and Y so that the cross-hair cannot wander off the edge of the screen. The two variables Dif and Mote are used to draw the cross-hair and move it around the board. Line 1180 Reads the scores for each sector of the board into an array S in a counter-clockwise fashion beginning and ending with the 6 (at three o'clock). The origin of the graphics page is set to the centre of the screen and we are set for drawing sectors and circles around this central point. The radii which delimit the bull, the outer bull, the trebles and the doubles are set in line 1200 and two variables C and S are set to the cosine and sine respectively of 0.02 of Pi because the sectors are drawn recursively to save time. I used the triangle fill mode to draw five pairs of triangles in each segment since this nicely fills the screen leaving a clear image without unlit pixels.

The main part of the board is drawn by a pair of nested For-Next loops. The outer loop — lines 1210-1280 — steps around the board in steps of 18 degrees.

The inner loop — lines 1230-1260 — draws four segments within each sector by calling Procedure Sector. Within this loop the colour is changed alternatively between the two logical, graphical foreground colours 0 and 1 by the line 1240 which uses the variable K which was initially set in line 1200. On leaving the inner loop the logical colour is once more changed to allow for the start of the next sector.

Procedure Sector Moves the graphics cursor to the start X,Y of the segment and Draws the leading edge up to the point X1, Y1. The third point of the triangle 1 is calculated recursively and the triangles are filled in. The next

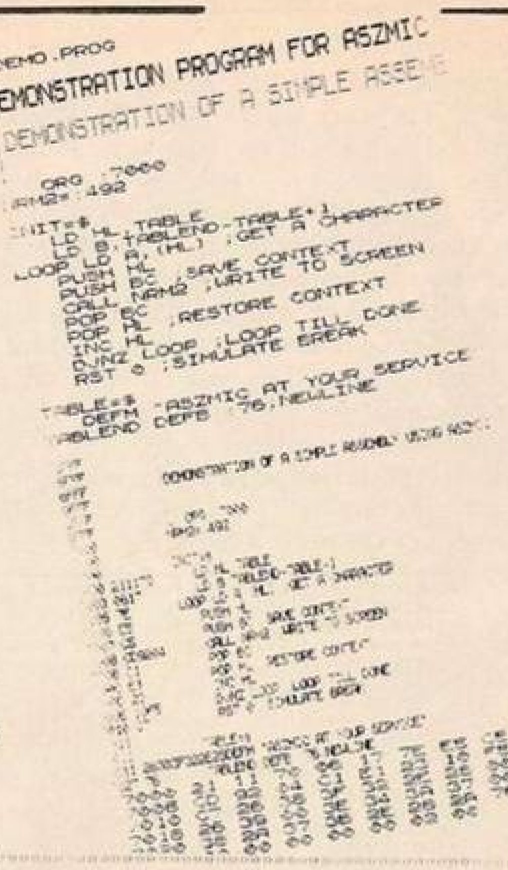
(continued on page 175)

```
10 MODE1:COLOUR2:COLOUR130:BEEB=FALSE
20 DIMR(5),S(20),SCORE(1),DARTX(3),DARTY(3),NAME$(1)
30 PRINTTAB(15,2)"BEEB-DARTS"
40 COLOUR3
50 PRINT:PRINT"The game is 501 down."
60 PRINT"Finish on a double or the bull."
70 COLOUR1
80 PRINT:PRINT"AIMING"
90 COLOUR3
100 PRINT:PRINT:PRINT"Up.....A          Down.....Z"
110 PRINT:PRINT"Left...K          Right....L"
120 PRINT:PRINT:PRINT"Throw with the space bar"
130 PRINTTAB(6,20)"Will there be 1 or 2 players?"
140 REPEAT
150   A$=GET$
160   UNTIL A$="1"ORA$="2"
170 IFA$="1"THENBEEB=TRUE
180 PRINTTAB(6)"What's the name of player 1"
190 INPUTNAME$(0)
200 IF NOT BEEB THENPRINTTAB(6)"What's the name of player 2":INPUTNAME$(1)
210 IF BEEB THENPRINT"The BEEB will be player 2":NAME$(1)="BEEB"
220 PRINT:PRINT"PRESS THE SPACE BAR TO PROCEED"
230 REPEAT
240   A$=GET$:UNTILA$=" "
250 MODE1:GCOL0,130:CLG:COLOUR130:COLOUR0
260 PROCBOARD
270 FINISH=FALSE
280 REPEAT
290   FORPLAYER=0TO1:SCORE(PLAYER)=501:PROCWRITESCORE
300     IFLEN(NAME$(PLAYER))>6THENNAME$(PLAYER)=LEFT$(NAME$(PLAYER),6)
310     NEXT
320   PLAYER=1
330   GAMEOVER=FALSE
340   REPEAT
350     PLAYER=ABS(PLAYER-1):DART=0:TSCORE=0
360     PROCWRITENAME
370     REPEAT
380       DART=DART+1
390        DOUBLE=FALSE:BUST=FALSE:WIREFLAG=FALSE
400       X=RND(470)-235:Y=RND(470)-235
410       PROCMOVECROSS
420       IFPOINT(X,Y)=2AND RND(7)=2THEN WIREFLAG=TRUE
430       PROCDART(X,Y)
440       *FX15,1
450       PROCTHUD
460       PROCSCORE
470       IFR<R(1) OR R>R(5)THENWIREFLAG=FALSE
480       PROCWRITESUB
490       PROCTOTALISE
500       UNTIL DART=3 OR GAMEOVER OR BUST
510     IF NOT BUST THENSCORE(PLAYER)=SCORE(PLAYER)-TSCORE
520     PROCWAIT
530     *FX15,1
540     PROCCLEARBOARD
550     PROCWRITESCORE
560     UNTILGAMEOVER
570   PROCWRITEND
580   REPEATA$=GET$:UNTIL A$="N"ORA$="Y"
590   IFA$="N"THENFINISH=TRUE
600   PROCWRITEND
610   VDU4
620   UNTIL FINISH = TRUE
630 MODE1:PRINTTAB(10,10)"BYE"
640 END
660 DEF PROCSCORE
670 DARTX(DART)=X:DARTY(DART)=Y
680 R=SQR(X^2+Y^2):IFR<R(0)THENSCORE=50:DOUBLE=TRUE:ENDPROC
690  IFR<=R(1)THENSCORE=25:ENDPROC
700 IFR>R(5)THENSCORE=0:ENDPROC
710 IFWIREFLAG THENSCORE=0:ENDPROC
720 THETA=ACS(X/R):IFY<0THENTHETA=2*PI-THETA
730 THETA=INT(0.7+THETA*10/PI-PI/20)
740 SCORE=S(THETA):IFR>=R(4)THENSCORE=SCORE*2:DOUBLE=TRUE:ENDPROC
750 IFR>R(3)ANDR<=R(2)THENSCORE=SCORE*3:ENDPROC
760 ENDPROC
780 DEF PROCWRITESUB
790 IFWIREFLAG THENPRINTTAB(1+PLAYER*34,25+DART)"wire"ELSEPRINTTAB(1+PLAYER*34
,25+DART);SCORE
800 ENDPROC
820 DEF PROCDART(X,Y)
830 D=DIF/2
840 MOVEX-D,Y-D
850 DRAWX+D,Y+D
860 MOVEX-D,Y+D
870 DRAWX+D,Y-D
890 ENDPROC
900 DEFPROCMOVECROSS
910 GCOL3,2
920 REPEAT
930   PROCRANDOM
940   IFX <XMIN THENX=XMIN
950   IFX >XMAX THENX=XMAX
960   IFY <YMIN THENY=YMIN
970   IFY >YMAX THENY=YMAX
980   PROCCROSS
990   A$=INKEY$(10)
1000   PROCCROSS
1010   IFA$="A" Y=Y+MOTE
1020   IFA$="Z" Y=Y-MOTE
1030   IFA$="K" X=X-MOTE
1040   IFA$="L" X=X+MOTE
1050   IFBEEB AND PLAYER=1THENPROCMYDARS
1060   UNTILA$=" "
```

(listing continued on page 175)

ZX81 MACHINE CODE?

ZX.ASZMIC rom transforms ZX81 into an **Assembly Language** programming unit



ø FULL~SCREEN EDITOR

Sixteen shift keys take you into a world with a word processor feel. A blink cursor moves at your command to control insertion, rubout, line or string deletion, atuoscroll & page flip up or down. Text block operations. Ulta-fast editing.

ø MULTI~FILE SYSTEM

Declare as many files as you like, with any names you like, & they are automatically handled by the Operating System. Merge them, delete them, print, save & load them, & edit them by name. Superb flexibility with a simple but powerful system.

ø TOTAL ASSEMBLER

Full Z80 mnemonics, unlimited length labels, ORG & EQU directives, proper assembly listings with errors flagged on screen or printer. Relocatable object code & options to faciliatate cross-assembly. Interpretive immediate execution available.

ø POWERFUL DEBUG

All the usual dump, modify, fill & copy commands; plus breakpoints, single stepping, context control, the convenience of interpretive execution mode, full use of the names in your program, Command Macros, autodump, and full operating system interface.

ø HI~RES GRAPHICS

255 × 144 resolution under program control to give you truly convincing graphics. With the power & flexibility of assembler you can really use this high definition.

ø MUCH, MUCH MORE

Repeat function on all keys. Double height & fine pitch on printer. Cassette catalogue. 120 page "ASZMIC GOLD" manual with training exercises, discussion chapters, sample programs, documented monitor routines & much reference information. Communicate with Basic via cassette (skeleton programs with machine code in REM) or via memory using the optional software switchable dual ROM board available from Capital Computers Ltd (£9 + vat). ASZMIC redefines the ZX81 hardware to give you an integrated development system with professional facilities which rival even very expensive systems. Why not get in touch for more details?

£39.95
incl. p&p

Comprocsys limited

I enclose £39.95. Please rush me ZN.ASZMIC + manual.
I enclose SAE. Please send me details of ZX.ASZMIC.
Cheques payable to Comprocsys Ltd.

Name ....

Address..

....

....

BOX No. 3 YOUR COMPUTER
ROOM L214, QUADRANT HOUSE,
THE QUADRANT, SUTTON, SURREY.

DOCTOR SOFT PRESENTS



*ALSO CURRENTLY ON PRESTEL VIA MICRONET 800

£7.95
32K
Wolfpack III

A NEW CONCEPT, A NEW CLASSIC

TRUE IN SPACE CUMULATIVE MOTION — UNLIMITED FREEDOM OF MOVEMENT. AMAZING COLOUR GRAPHICS & SOUND!
"SOMETIMES YOUR FIRST WARNING IS A LANCING DISRUPTER BEAM STRIKING FROM BEYOND VISUAL RANGE, SOMETIMES THEY MATERIALISE CLOSE AT HAND. YOU ARE EITHER QUICK OR DEAD!"

PROWL LUSH STARFIELDS COMMANDING A MIGHTY FLEET OF DEADLY STARCRUISERS. CAREFULLY PLAN YOUR STRATEGY. SWITCH CONTROL FROM SHIP TO SHIP. EACH HAS ITS OWN MISSION, ITS OWN DESTINY.

SEEK OUT LETHAL ENEMY BATTLE STATIONS, PLANETS, CRUISERS & PHANTOMS USING BASE STATION RADAR & TARGET DATA.

FIGHT TO THE DEATH! DETONATE THE ENEMY FOR A HARVEST OF ENERGY TO TRANSPORT TO BASE. LOSE, & RISK A RESCUE UNDER HEAVY FIRE!

FEATURES INCLUDE: REAL & ENHANCED TIME, DOCKING, REFUELLING, ROTATING BASE STATION, METEOR STRIKES, RANK & PROMOTION, DAMAGE REPORTS, CREW COMMENTS, HYPERSPACE WARP BETWEEN GALAXIES & SEPARATE BRIEFING PROGRAM. *A TOTAL EXPERIENCE!*

OTHER DOCTOR SOFTWARE FOR BBC MICRO

747 32K	**£6.95**	FULL BLOWN FLIGHT SIMULATOR BY THE SAME B.A. CAPTAIN WHO WROTE THE FAMOUS ATOM PROGRAM
KREMLIN 32K	**£6.95**	3D MULTI LEVEL MAZE ESCAPE WITH GREMLIN KOMBAT! MAPS, SKILL LEVELS, STANDARD OR RANDOM STRUCTURE
HARMONY 16K	**£5.95**	DELIGHTFUL, INFINITE, SAVEABLE PATTERNS OF LIGHT & SOUND

ROYALTIES THE DOCTOR PAYS TOP ROYALTIES FOR TOP PROGRAMS! ALL POPULAR MACHINES, ALL TYPES OF SOFTWARE.

NO EXTRAS! ALL PRICES FULLY INCLUSIVE.

CHEQUES & P.O. TO:
DOCTOR SOFT
258 CONEYGREE RD
STANGROUND
PETERBOROUGH PE2 8LR

BBC MICRO

DOCTOR SOFT
ADVANCED SOFTWARE



MicroBase. Fits your computer into your home. With style.

MicroBase. Crafted in solid mahogany, hand polished and superb quality. Complete with fitted nylon dustcover to suit TV's with up to 14" screens. MicroBase suits most computers - Sinclair, BBC, Atom, VIC, Oric, Dragon, Lynx, etc., plus room for accessories. Price £20, postage £2, VAT included.

To Order...
please send your payment to:
Peter Furlong Products, Unit 5 y, South Coast Road Ind. Estate, Peacehaven, E. Sussex BN9 8NA. Tel. (07914) 81637. ACCESS, VISA.
Please state make of computer.

Dealers...
MicroBase will enhance your displays and your profits. Check out our special offer.

Custom display units supplied.

(listing continued from page 173)

```
1070 ENDPROC
1090 DEF PROCHOUSE
1100 MOVEX-DIF,Y
1110 DRAWX+DIF,Y
1120 MOVEX,Y-DIF
1130 DRAWX,Y+DIF
1140 ENDPROC
1160 DEF PROCBOARD
1170 XMIN=-630:XMAX=630:YMIN=-512:YMAX=512:K=0:MODE1
1180 FORI=0TO20:READS(I):NEXT
1190 VDU5:VDU29,640;512;
1200 R(0)=10:R(1)=30:R(2)=250:R(3)=280:R(4)=440:R(5)=470:C=COS(PI/10):S=SIN(PI/
10):K=1
1210 FORI=PI/20TO2*PI-PI/20STEPPI/10
1220   C1=COS(I):S1=SIN(I)
1230   FORL=1TO4
1240     GCOL0,K:K=ABS(K-1)
1250     PROCSECTOR(R(L)*C1,R(L)*S1,R(L+1)*C1,R(L+1)*S1)
1260     NEXTL
1270   GCOL0,K:K=ABS(K-1)
1280   NEXTI
1290 FORI=0TO19:MOVE490*COS(I*PI/10)-300-25*((S(I)=18)+(S(I)=13)+(S(I)=10)+(S(I
)=15)),490*SIN(I*PI/10)+10
1300   PRINTS(I):NEXT
1310 GCOL0,2
1320 FORI=PI/20TO2*PI-PI/20STEPPI/10
1330   X=R(5)*COS(I):Y=R(5)*SIN(I)
1340   MOVE0,0:DRAWX,Y
1350   NEXT
1360 FORI=2TO4:PROCCIRCLE(R(I)):NEXT
1370 GCOL0,0
1380 C=PI/10:MOVE0,0
1390 FORI=1TO21:X=R(0)*COS(C*(I-1)):Y=R(0)*SIN(C*(I-1))
1400   MOVE0,0:PLOT85,X,Y
1410   NEXTI
1420 VDU4
1430 ENDPROC
1450 DEF PROCSECTOR(X,Y,X1,Y1)
1460 MOVEX,Y:DRAWX1,Y1
1470 FORJ=1TO2
1480   T=X*C-Y*S:Y=Y*C+X*S:X=T
1490   PLOT85,X,Y
1500   T=X1*C-Y1*S:Y1=Y1*C+X1*S:X1=T
1510   PLOT85,X1,Y1
1520   NEXTJ
1530 ENDPROC
1550 DEF PROCTOTALISE
1560 IFSCORE=SCORE(PLAYER)-TSCORE ANDDOUBLE=TRUE THEN GAMEOVER=TRUE:ENDPROC
1570 IFSCORE>=SCORE(PLAYER)-TSCORE-1THENPROCBUST:ENDPROC
1580 TSCORE=TSCORE+SCORE
1590 ENDPROC
1610 DEF PROCBUST
1620 SOUND 1,-15,100,10
1630 BUST=TRUE
1640 ENDPROC
1660 DEF PROCWRITESCORE
1670 FLAG=FALSE:SCORE=SCORE(PLAYER)
1680 IFSCORE<41AND(SCORE/2-INT(SCORE/2))<0.1THENSCORE=SCORE/2:FLAG=TRUE
1690 PRINTTAB(1+PLAYER*35,4);"    "
1700 PRINTTAB(1+PLAYER*35,4);SCORE;
1710 IFFLAG PRINT "D"
1720 ENDPROC
1740 DEF PROCCLEARBOARD
1750 FORI=1TODART
1760   PROCDART(DARTX(I),DARTY(I))
1770   PRINTTAB(1+PLAYER*34,25+I);"      "
1780   PROCWAIT
1790   NEXTI
1800 ENDPROC
1820 DEF PROCCIRCLE(R)
1830 C=COS(0.05):S=SIN(0.05):X=R:Y=0
1840 MOVEX,Y
1850 FORJ=1TO128:T=X*C-Y*S:Y=Y*C+X*S:X=T
1860   DRAWX,Y
1870   NEXTJ
1880 ENDPROC
1900 DEF PROCWAIT
1910 FORJ=1TO1000:NEXTJ
1920 ENDPROC
1940 DEF PROCMYGAME
1950 PROCWAIT
1960 A$=" "
1970 IF SCORE(PLAYER)>180THENX=0:Y=R(2)+10:PROCRANDOM:ENDPROC
1980 IF SCORE(PLAYER)-TSCORE>100THENX=0:Y=R(3)+25:PROCRANDOM:ENDPROC
1990 IF SCORE(PLAYER)-TSCORE>61THENX=30:Y=R(3)+30:PROCRANDOM:ENDPROC
2000 IFSCORE(PLAYER)-TSCORE=50THENX=0:Y=5:PROCRANDOM:ENDPROC
2010 IF SCORE(PLAYER)-TSCORE>40THENX=R(3)+30:Y=0:PROCRANDOM:ENDPROC
2020 SCORE=(SCORE(PLAYER)-TSCORE)/2
2030 IFSCORE-INT(SCORE)<.1THENI=0:REPEAT:I=I+1:UNTILSCORE=S(I):THETA=PI*I/10-PI
/20:R=R(4)+5:X=R*COS(THETA):Y=R*SIN(THETA):ELSEX=80:Y=330
2040 PROCRANDOM
2050 ENDPROC
2070 DEF PROCRANDOM
2080 D=RND(3)-2:E=RND(3)-2
2090 X=X+D*15:Y=Y+E*15
2100 ENDPROC
2120 DEF PROCWRITEND
2130 PRINTTAB(1,2)"          "
2140 VDU5:GCOL3,3
2150 MOVE 640,504:PRINT"WINNER: ";
2160 PRINTNAME$(PLAYER)
2170 PRINT"ANOTHER GAME?"
2180 PRINT"Y/N"
2190 ENDPROC
2210 DEF PROCWRITENAME
2220 IFPLAYER=0THENPRINTTAB(72,2)"          "ELSEPRINTTAB(1,2)"          "
2230 SOUND1,-15,100,7
2240 PRINTTAB(1+33*PLAYER,2)NAME$(PLAYER)
2250 ENDPROC
2270 DEF PROCTHUD
2280 SOUND0,-15,6,5
2290 ENDPROC
2310 DATA6,13,4,18,1,20,5,12,9,14,11,8,16,7,19,3,17,2,15,10,6
```

(continued from page 173)

triangle 2 is drawn and then on the next pass of the loop two new points are calculated and two new triangles are filled in. In this way each segment of each sector is drawn using pairs of triangles.

Lines 1290 and 1300 print the scores — the array S — around the board by calculating the necessary points on the circle, and slightly adjusting the position for the numbers 18, 13, 10 and 15 so that the board appears balanced. Note that the Text and Graphics Cursor were combined in line 1190. Line 1360 draws the wires around the board using the Procedure Circle with the necessary radii being passed to it. The only thing left to do is draw the bull in the centre; again done by the Plot 85 command.

The game proceeds by a set of nested Repeat-until loops. The outer is controlled by the logical variable Finish which only becomes true when the player elects to end the game in lines 580, 590.

The next inner loop — lines 340-560 — is controlled by the logical variable Gameover which is set true in Procedure Totalise if the scoring is okay for a permissible finish to the game.

The next loop in is controlled by three variables, Dart, Gameover, and Bust. The latter is set true in Procedure Bust if the cumulative score — the variable TScore — for the three darts — controlled by the counter Dart — is greater than the score — Score (Player) — already obtained by the player.

In the innermost loop a series of Procedures first move the cross-hair around the board using the GCOL 3 command to first draw — line 980 — and then erase — line 1000 — a cross at a position X,Y which is randomly moved in a Repeat-Until loop unless the player moves it.

Within this loop a check is made — line 1050 — to see if the machine should play, in which case Procedure Mygame is invoked. Here a series of simple If statements is used to make a decision about where to land a dart. X and Y are set but to make it fairer X and Y are randomised by the same degree to which the cross-hair's movement is subjected.

Line 420 checks to see whether a wire has been hit. Because they were drawn in the background colour 2 — yellow — line 470 has to reset the logical variable Wireflag back to False if the point was really off the board or in the 25 region. This could have been allowed for in line 420. Note that the darts are drawn in yellow on a black background and so hitting a dart can result in a zero score and the message "wire". The rest of the program is concerned with drawing the dart, writing the score of each individual dart, and writing the scores of the players together with their names. The only complicated part occurs in Procedure Score. Here the position of the dart is first remembered by the arrays DartX and DartY for subsequent removal and then the radial distance of the dart from the board's centre is calculated in line 680. A series of Ifs then checks this radial distance R to provide initial scorings. The order of these is quite important because the number of checks can be kept to a minimum. Thus scores of 50, 25 and 0 are easily checked. After checking — line 710 — for the wire having been hit, the angle measured anti-clockwise round the board from the middle of the 3 o'clock sector — that scoring 6 — is calculated by the ACS function — line 720 — which may have to be adjusted if the dart is in the bottom half of the board.

The next line, 730, essentially takes this angle Theta and divides it by PI/10 to calculate which sector the dart is in and therefore which array element will provide the score. PI/20 is subtracted to allow for the counter-clockwise rotation around the circle. Now here comes the slightly non-mathematical "adjustment" to make the scoring right. If the dart were to land in the bottom part of sector 6 the measured angle would be slightly negative and so 1 should be added to the calculation to give the array element. However, because of the way the sectors were drawn, the trigonometry is slightly awry and so I only add 0.7. This makes the scoring correct as it appears on the screen. Having found which sector the dart is in, it is an easy matter to check for doubles and trebles by looking at the radial distance from the centre of the board — lines 740-750. If the score is a double then the logical variable Double is set true. Note that it is also set true if 50 is scored because it is used to check for a legal end to the game in line 1560.

Synthesiser

Andrew Parker,
Warrington.

C.B.M.-64

THIS PROGRAM uses all the features of the 64's sound chip, using the whole of the keyboard to play like a musical instrument. It occupies 10K of memory. The keyboard is set out as

(continued on page 176)

```
5 POKE53280,0:POKE53281,0
10 PRINT"[CLR]"
15 PRINT"[RVS]                                    [OFF]";
20 PRINT"[RVS]   THE COMMODORE 64 MUSIC SYNTHESISER   [OFF]";
25 PRINT"[RVS]                                    [OFF]";
30 PRINT:PRINT"THIS USES THE FIRST VOICE OVER A RANGE"
40 PRINT"OF NEARLY 3 OCTAVES"
50 PRINT"THE WAVEFORM IS CHANGEABLE DURING USE BY"
53 PRINT"PRESSING [RVS]F1[OFF] FOR TRIANGLE,[RVS]F3[OFF] FOR SAWTOOTH",
56 PRINT"[RVS]F5[OFF] FOR PULSE AND [RVS]F7[OFF] FOR NOISE"
58 PRINT"ADSR AND PULSE LEVELS (IF REQUIRED)"
60 PRINT"ARE SET AFTER THESE INSTRUCTIONS"
70 PRINT"THE SHARPS ARE THE KEYS 2,3,4,6,7,9,0,+,";
75 PRINT"\ AND [RVS]CLR/HOME[OFF]"
80 PRINT:PRINT"THE NORMAL NOTES ARE FOR Z TO / AND"
90 PRINT"FROM Q TO ↑"
95 PRINT:PRINT"      [RVS] HIT ANY KEY TO START [OFF]"
96 GETA$:IFA$=""THEN96
98 PRINT"[CLR]"
100 DIMNO(64,2)
110 FORC=1TO62
120 READNO(C,1),NO(C,2)
130 NEXTC
140 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
```

(listing continued on page 176)

(continued from page 175)

shown in the diagram, the keys from Z to the oblique stroke acting as normal notes and the keys S, D, G, H, J, L and , acting as the sharps. The same is true for the top two rows of keys. The sharps are on 2, 3, 4, 6, 7, 9, 0, +, £ and the CLR/HOME key. This gives a range of just over three octaves.

The waveform can either be triangle, sawtooth, pulse or noise. These govern the shape of the sound wave. The attack-decay and sustain-release determine how long it takes for a note to reach its peak volume — attack — to fall from its peak volume to sustain level — decay — how long it stays at this level — sustain — and how long the note takes to fall from the sustain level — release.

The waveform can be changed during the running of the program by using the function keys (see program listing). The instructions are contained in lines 10-95. Lines 100 to 230 read in the high and low frequency values into an array. The place in the array into which the note is placed is governed by the value in the keyboard buffer (location 197) for that key. The main locations are:

54296-Volume control
54273-High frequency
54272-Low frequency
54276-Waveform
54275-High pulse
54274-Low pulse
54277-Attack/Decay
54278-Sustain/Release

These locations are used for voice one only, voices 2 and 3 have different locations. In Line 462, Poke 198,0 clears the keyboard buffer after each key.

(listing continued from page 175)

```
150 DATA27,56,25,177,0,0,30,141,8,147,9,21,28,214
160 DATA0,0,0,0,32,94,10,60,36,85,10,205
170 DATA0,0,34,75,9,159,40,200,38,126,12,32
180 DATA0,0,12,216,13,156,43,52,11,114,48,127
190 DATA45,198,15,70,54,111,16,47,0,0,51,97
200 DATA14,107,61,126,57,172,18,42,0,0
210 DATA19,63,20,100,64,60,17,37,72,169,60,149
220 DATA0,0,81,161,0,0,0,0,76,252,21,154
230 DATA0,0,0,0,0,0,24,63,0,0,0,0,22,227,0,0
240 VOL=54296
250 HFR=54273
260 LFR=54272
270 WFM=54276
280 HPE=54275
290 LPE=54274
300 AD=54277
310 SR=54278
320 PRINT"WAVEFORM:"
330 PRINT"17 = TRIANGLE"
340 PRINT"33 = SAWTOOTH"
350 PRINT"65 = PULSE"
360 PRINT"129= NOISE"
365 INPUTR
370 INPUT"ATTACK/DECAY";L(1)
380 INPUT"SUSTAIN/RELEASE";L(2)
390 IFR<>65THEN420
400 INPUT"HIGH PULSE  (0-15)";P(1)
410 INPUT"LOW PULSE  (0-255)";P(2)
420 REM**KEYBOARD SCAN**
430 POKEVOL,15
435 POKELPE,P(2):POKEHPE,P(1)
440 POKEAD,L(1)
450 POKESR,L(2)
455 POKEWFM,R
460 S=PEEK(197)
462 POKE198,0
463 GOSUB2000
465 IFS=60THENPOKEVOL,0:POKEWFM,0:POKEAD,0:POKESR,0:
    GOTO9999
490 IFS=64THEN460
500 POKEHFR,NO(S,1)
510 POKELFR,NO(S,2)
515 IFPEEK(197)=STHEN515
520 POKEWFM,0
540 GOTO430
600 POKEVOL,5
610 GOTO430
2000 IFS=4THENR=17
2010 IFS=5THENR=33
2020 IFS=6THENR=65:GOTO400
2030 IFS=3THENR=129
2040 RETURN
5200 POKEAD,0:POKESR,0:POKEWFM,0
9999 PRINT"♫"
```

Tape examiner

M Salmon,
Abingden,
Oxfordshire.

SPECTRUM

THE SPECTRUM saves files as two blocks — header and data. The data may be of any length and could represent anything, so the header is needed to tell the Spectrum how to interpret the data. The header is composed of 17 bytes, as follows:

offset	description
0	file type: 0 = program, 1 = number array, 2 = string array, 3 = bytes
1-10	filename in ASCII
11-12	total length in bytes of data to be read in
13-14	special
15-16	program length in bytes

Bytes 13 and 14 are used for any specific information required. For type 0 files it contains the auto-run line number — unless it is more than 32767 which signifies load only. For type 3 files it contains the start address for Load "" Code with no parameter. For types 1 and 2 only byte 14 is used. This contains packed information for the aid of the floating point calculator. Bits 0-4 give the ASCII code minus 64 of the original array saved and bit 6 tells what type of array it is (0 = number, 1 = string). Bit 7 is always set.

The table above is given with offsets as the method used for reading files from tape is by calling a routine with a buffer pointed to by the 16 bit index register IX.

The program contins a small machine routine to do this:

175	XOR A
55	SCF
221,33,16,127	LD IX,32528
205,86,5	CALL 1414
201	RET

This is set up by lines 10-30. Line 40 sets B to point to the buffer and sets up a user-defined function to extract a double-byte number from an offset X.

Line 50 calls the machine-code subroutine and the Spectrum waits for a header to come in from the cassette port.

```
  10 CLEAR 32511
  20 FOR a=32512 TO 32521: READ
b: POKE a,b: NEXT a
  30 DATA 175,55,221,33,16,127,2
05,86,5,201
  40 LET b=32528: DEF FN a(x)=PE
EK (b+x)+256*PEEK (b+x+1)
  50 RANDOMIZE USR 32512
  60 LET c=PEEK b
  70 IF c>3 THEN GO TO 50
  80 PRINT "Filename: ";
  90 FOR a=b+1 TO b+10: PRINT CH
R$ PEEK a;: NEXT a
 100 PRINT : PRINT TAB 4;"Type:
";
 110 GO SUB 1000+100*c
 120 PRINT : PRINT
 125 POKE b,255
 130 GO TO 50
1000 PRINT "program"
1010 PRINT "Total length: ";FN a
(11);" bytes"
1020 PRINT "Program length: ";FN
 a(15);" bytes"
1030 IF FN a(13)>9999 THEN PRINT
 "Load only": RETURN
1040 PRINT "Runs from line ";FN
a(13)
1050 RETURN
1100 PRINT "number array"
1110 LET a$="": GO TO 1220
1200 PRINT "character array"
1210 LET a$="$"
1220 PRINT "Array length: ";FN a
(11);" bytes"
1230 LET d=PEEK (b+14)
1240 PRINT "Original array name:
 ";CHR$ (64+32*(d/32-INT (d/32))
);a$
1250 RETURN
1300 IF FN a(11)=6912 AND FN a(1
3)=16384 THEN PRINT "screen imag
e": RETURN
1310 PRINT "bytes"
1320 PRINT "Start address: ";FN
a(13)
1330 PRINT "Length: ";FN a(11);"
 bytes"
1340 RETURN
```

Line 60 extracts the filetype and line 70 skips the output section if it decides that this is not a header. Lines 80-100 print the filename and line 110 chooses the appropriate routine to use for decoding on the basis of the filetype. This means that it is vitally important that the routines starting at lines 1000, 1100, 1200 and 1300 remain at these lines — otherwise numbering is unimportant. Line 1300 is the only other interesting point — it automatically decides whether a bytes file is a screen image or not.

Spectrum owners with an understanding of machine-code and a good disassembler should find the area of the ROM between 4C2 and 9F3 — hex — interesting to inspect as the tape-handling routines are self-contained. I would advise starting at 605 hexadecimal as this is the highest level of tape handling. The prospective decoder should be helped by the knowledge that the low byte of TADDR will contain a byte ranging from E0-E3 corresponding to the keywords Save, Load, Verify and Merge respectively.

Memory man

TR Carey,
Southampton,
Hampshire.

ZX-81

IF YOU want to know how much memory has been used by various things this program will run on any ZX-81 but it is not really suitable for the 1K machine as the memory is very limited. Using the memory map on page 177 of the ZX-81 manual and the systems variables on pages 177/9. The systems variables are used to find the addresses of different parts of the memory. This program is very useful when writing programs and it can be removed afterwards.

```
9996 PRINT TAB 8;"ZX 81 MEMORY",
,,"TOTAL RAM",((PEEK 16388+256*P
EEK 16389)-16384)/1024;" K"
9997 PRINT ,,"BASIC PROGRAM",(PE
EK 16396+256*PEEK 16397)-16509;"
BYTES"
9998 PRINT ,,"VARIABLES",(PEEK 1
6404+256*PEEK 16405)-(PEEK 16400
+256*PEEK 16401)-1;" BYTES"
9999 PRINT,, "SPARE MEMORY",(PEE
K 16388+256*PEEK 16389)-(PEEK 16
404+256*16405);" BYTES"
```

Definer

Brian Etherington,
Hanslope,
Milton Keynes.

BBC

THIS IS A MULTICOLOUR character definer for a 32K BBC Micro. The cursor is moved around an eight by eight grid to define a new character. As new pixels are added or deleted from the new character, the VDU statement parameters are updated on the right-hand side of the grid, in line with each of the eight grid rows. Similarly, the character is displayed in mode 2 graphics to the left of the larger grid. At the bottom of the screen in a 16-colour paint palette, the current ink colour is indicated by the arrow. The ink colour is changed by pressing the space bar. In this

(continued on page 179)

THE CURSE

"Know, Oh Prince . . .
There was a time when the world cowered in the shadow of the Dark Ring, Shedir, and the people cried out for a hero."

THE LEGEND

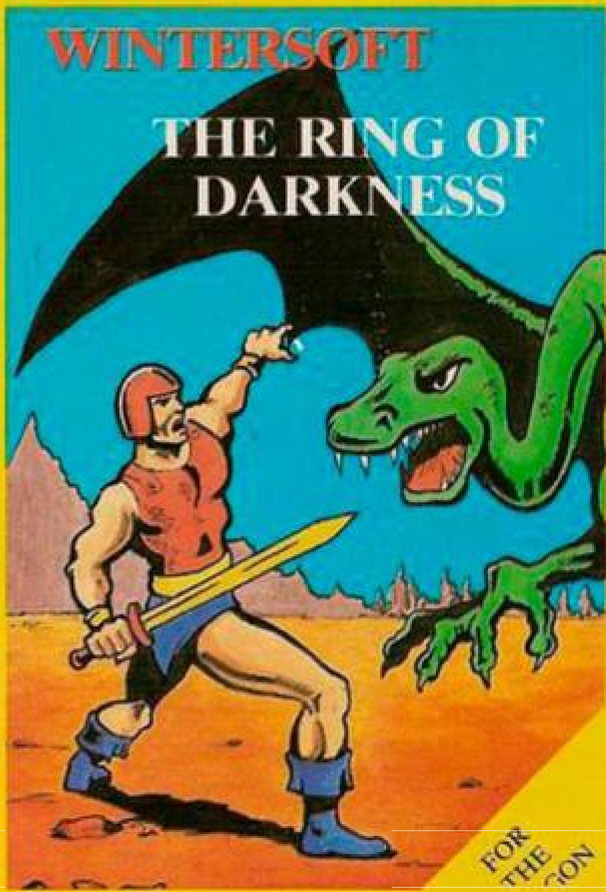
". . . and it was foretold that a hero would come at last. An adventurer, maybe a great wizard or yet a lowly thief, maybe the son of man or mayhap of elvenkind . . ."

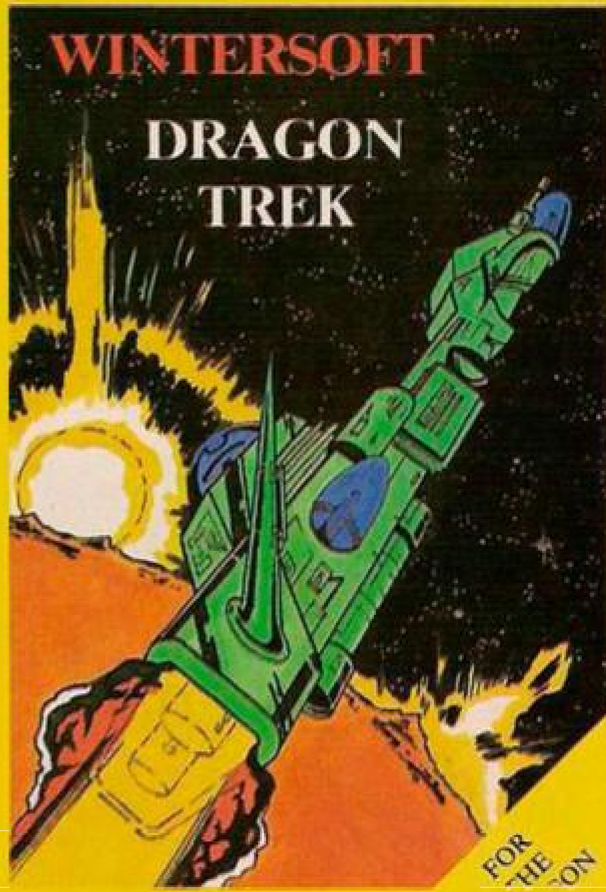
THE RING OF DARKNESS

The game created to be the most complete, enthralling, addictive and detailed adventure ever written for the Dragon 32. A whole graphic world (of nearly 3,000 travel days) with kings, princesses, mad jesters, evil rangers and dangerous quests will unfold before you. Across ocean, river, mountain and forest you travel, to trade in many towns and dare the depths of vast dungeons (more than 9 levels deep with over 20 different creatures in hires 3-D graphics) in search of strength and fortune.

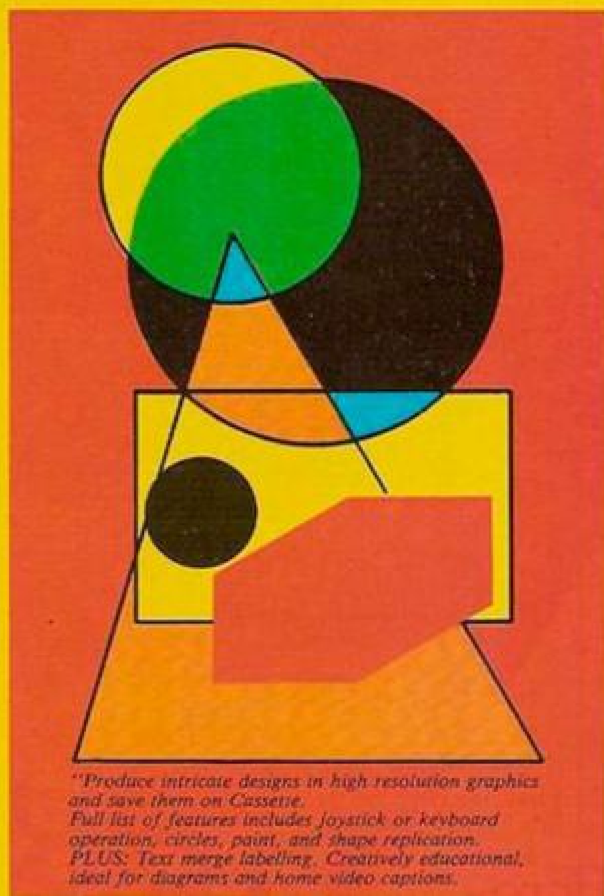
Many hours of mystery, suspense and raw excitement await you, and of course, you may be the hero (or heroine) of whom the legend foretold.

"The most impressive adventure tested . . . soon displaced breakfast TV in our house" *Your Computer* (April).









AND FOR REALLY HUNGRY DRAGONS:

PEPPER'S GAME PACK

Trap a wizard, fly a trecherous canyon, zap huge blue mushrooms, bash bricks, crack codes and trap the chessboard runner. Six great games on one cassette. Fantastic value.

DRAGON TREK

Take command of your own starship and seek out the enemy fleet. Features mixed text and graphics in high-resolution. "excellent value for money . . . the title sequence was magnificant" *Your Computer.*

ARTIST'S DESIGNER

A complete high-resolution graphics utility. Features include keyboard or joystick control, circles, paint, shape replication and text merging. Ideal for software development, education and home video captions.



WINTERSOFT
Dedicated to the highest quality software and customer service.
Tel: 01-928 5945 and 01-633 9611

All prices include P&P, VAT and the WINTERSOFT guarantee of quality and reliability.

Available from good software outlets.

Dealer enquiries welcome.

Post coupon now to:
S.W. WINTER & CO. LTD.
101 Westminster Bridge Road, London SE1 7HR
Please rush me copies of (tick box)

☐	The Ring of Darkness	£10.00
☐	Pepper's Game Pack	£7.95
☐	Dragon Trek	£6.99
☐	Artist's Designer	£6.99

I enclose Cheque/P.O. for: £

NAME ....

ADDRESS ....

Micro-Professor

THE 64K COMPUTER THAT SPANS GENERATIONS.



The complete 'family' micro-computer...

The **Micro Professor** is truly a family computer. With its powerful **64K RAM** and **16K ROM**(including 12K bytes for BASIC) it can handle the needs from the children to the office environment. Since the **Micro Professor** runs most of the existing APPLE II Software you will never be at a loss for home management and entertainment programmes. You and your family will also want to explore the emerging worlds of computer music, art, design and animation.

The Micro Professor can do all this and more.

In business, the **Micro Professor** can be a valuable tool at work with its capability to handle APPLE II Software you have access to a wide range of programmes such as accounting, payroll, job costing and inventory control, or if you have a special problem unique to your business you can write your own programmes in BASIC or go to high level languages such as PASCAL, FORTH, LOGO and PILOT.

Micro-Professor Peripherals:

- **55 Key, full-size keyboard with single stroke BASIC commands.**
- **Floppy Disc drive.**
- **Thermal or dot matrix printer.**
- **Joystick controls.**

16K ROM (includes 12K of BASIC) makes it easy.

The kids will love the excellent range of games available, 120 at present and growing all the time, plus with the knowledge that the **Micro Professor** is capable of handling APPLE II Software they can possibly relate to the APPLE II computer they are using at school. With its six colours plus high and low resolution graphics the **Micro Professor** will sustain the most enquiring mind to explore the world of computer aided design.

AVAILABLE THROUGH YOUR LOCAL spectrum COMPUTER STORE.

Micro-Professor

Apple II is a trademark of Apple Computer Inc.

MPF II MASSIVE FOR A MICRO.

Exclusive U.K. Importers:
SIRTEL (UK) LTD., 19/24 Alfric Square, Off Maxwell Road, Woodston Industrial Estate, Peterborough PE2 0JP. Tel: (0733) 236010/233955

(continued from page 176)

way, overlaid multicoloured graphics characters may be defined and automatically displayed. The VDU parameters are displayed for each colour as you step through the paint palette.

The program has been written in fully-structured Basic and makes extensive use of BBC Basic procedures. The only Goto statement in the entire program is at line 140. Note the procedure Cursoron at line 1200 redefines a different form of cursor to that which is normally available. I believe that this program represents a valuable software-development tool for the BBC microcomputer, and is unusual in that it allows for multi-coloured character generation. In addition, the program is an example of good programming technique for those just learning the craft. Multicoloured characters can be printed using the VDU5 and move commands. The following example prints a character in red, white and blue. It assumes that characters 224-226 have been defined by the user:

```
5 MODE 2
10 BLUE$ = CHR$ 18 + CHR$ 0 + CHR$ 4
20 RED$ = CHR$ 18 + CHR$ 0 + CHR$ 1
30 WHITE$ = CHR$ 18 + CHR$ 0 + CHR$ 7
40 A$ = BLUE$ + CHR$ 224 + CHR$ 8 +
   RED$ + CHR$ 225 + CHR$ 8 + WHITE$ +
   CHR$ 226
50 VDU 5
60 MOVE 640, 512 : PRINT A$
```




```
10 REM ***********************************************
20 REM *                                             *
30 REM * MULTI-COLOUR CHARACTER DEFINITION PROGRAM *
40 REM *                                             *
50 REM * AUTHOR :- B.J.W.ETHERINGTON                 *
60 REM *            JANUARY 1983                     *
70 REM *                                             *
80 REM ***********************************************
90 REM
100 ON ERROR RUN
110 DIM GRID%(8,8),ROW%(15,9),SHADE$(15)
120 MODE 2
130 PROC_INITIALISE
140 PROC_INPUT:GOTO 140
150 DATA RED,GREEN,YELLOW,BLUE,MAGENTA,CYAN,WHITE,FLASH BLACK-WHITE,FLASH RED-
CYAN,FLASH GREEN-MAGENTA,FLASH YELLOW-BLUE,FLASH BLUE-YELLOW,FLASH MAGENTA-GREEN
,FLASH CYAN-RED,FLASH WHITE-BLACK
160 REM ************************************************************ INITIALISE
170 DEF PROC_INITIALISE
180*FX4,1
190FOR I%=1 TO 8:FOR J%=1 TO 8:GRID%(I%,J%)=0:NEXT:NEXT
200FORI%=1 TO 15:ROW%(I%,9)=0:READ SHADE$(I%):NEXT
210X%=1:Y%=1
220 VDU 23,224,&FF,&FF,&FF,&FF,&FF,&FF,&FF,&FF
230 VDU 23,240,3,1,1,1,1,1,1,3
240 VDU 23,241,0,0,0,0,0,0,129,255
250 VDU 23,242,255,129,0,0,0,0,0,0
260 VDU 23,243,192,128,128,128,128,128,128,192
270 VDU 23,244,16,16,16,16,84,56,16,0
280PROC_SCREEN
290PROC_CURSORON
300PROC_MOVE(0,0)
310PROC_DISPLAY
320ENDPROC
330REM ************************************************************ SCREEN
340DEF PROC_SCREEN
350CLS:COLOUR 7
360PRINT " CHARACTER DEFINER"
370 COLOUR 2
380 PRINT TAB(0,14);"Use normal cursor";
390PRINT TAB(0,15);"movement keys to";
400PRINT TAB(0,16);"Position cursor.";
410 PRINT TAB(0,18);"Make a mark using";
420 PRINT TAB(0,19);"the COPY key.";
430 PRINT TAB(0,21);"Erase a mark using";
440 PRINT TAB(0,22);"the DELETE key.";
450 PRINT TAB(0,24);"Press SPACE BAR to";
460 PRINT TAB(0,25);"change ink colour.";
470 PRINT TAB(0,27);"Press ESCAPE to";
480 PRINT TAB(0,28);"define new character";
490 FOR I%=1 TO 15:COLOUR I%:PRINT TAB(I%+1,31);CHR$(224);:NEXT
500 INK%=6
510 PROC_INK
520PRINT TAB(6,1);STRING$(8,CHR$(241));
530PRINT TAB(6,10);STRING$(8,CHR$(242));
540 VDU 31,5,2,240,8,10,240,8,10,240,8,10,240,8,10,240,8,10,240,8,10,240,8,10,
240
550 VDU 31,14,2,243,8,10,243,8,10,243,8,10,243,8,10,243,8,10,243,8,10,243,8,10
,243
560 ENDPROC
570REM ************************************************************ INPUT
580DEF PROC_INPUT
590 A=GET
600 IF A=&88 PROC_MOVE(-1,0):ENDPROC
610 IF A=&89 PROC_MOVE(1,0):ENDPROC
620 IF A=&8B PROC_MOVE(0,-1):ENDPROC
630 IF A=&8A PROC_MOVE(0,1):ENDPROC
640 IF A=&20 PROC_INK:ENDPROC
650 IF A=&87 PROC_MARK(INK%):ENDPROC
660 IF A=&7F PROC_MARK(0):ENDPROC
670ENDPROC
680REM ************************************************************ MOVE
690DEF PROC_MOVE(XINC%,YINC%)
700X%=X%+XINC%:Y%=Y%+YINC%
710IF X%>8 X%=1
720IF X%<1 X%=8
730IF Y%>8 Y%=1
740IF Y%<1 Y%=8
750 PRINT TAB(X%+5,Y%+1);
760ENDPROC
770REM ************************************************************ MARK
780DEF PROC_MARK(A%)
790IF GRID%(Y%,X%)=A% ENDPROC
800COLOUR A%
810VDU 224,8
820IF GRID%(Y%,X%)<>0 TINK%=GRID%(Y%,X%):GRID%(Y%,X%)=0:PROC_CALC(TINK%)
830GRID%(Y%,X%)=A%
840 PROC_DISPLAY
850ENDPROC
860REM ************************************************************ INK
870DEF PROC_INK
880PROC_CURSOROFF
890COLOUR 7
900PRINT TAB(INK%+1,30);" ";
910INK%=INK%+1
920IF INK%>15 INK%=1
930PRINT TAB(INK%+1,30);CHR$(244);
940PRINT TAB(0,11);STRING$(40," ");
950 PRINT TAB(0,11);SHADE$(INK%);
960COLOUR INK%
970PROC_VDU
980PROC_MOVE(0,0)
990PROC_CURSORON
1000ENDPROC
1010REM ************************************************************ DISPLAY
1020DEF PROC_DISPLAY
1030PROC_CURSOROFF
1040PROC_VDU
1050 VDU 5
1060 MOVE 192,847
1070 VDU 9,127
1080FOR I%=1 TO 15
1090IF ROW%(I%,9)=1 PROC_SHOW(I%)
1100NEXT
1110 VDU 4
1120 COLOUR INK%
1130PROC_MOVE(0,0)
1140PROC_CURSORON
1150ENDPROC
1160 REM ************************************************************ CURSOROFF
1170 DEF PROC_CURSOROFF
1180VDU 23,0,10,32,0;0;0;
1190 ENDPROC
1200 REM ************************************************************ CURSORON
1210 DEF PROC_CURSORON
1220VDU 23,0,10,67,0;0;0;
1230VDU 23,0,11,4,0;0;0;
1240ENDPROC
1250 REM ************************************************************ SHOW
1260 DEF PROC_SHOW(A%)
1270 GCOL 0,A%
1280VDU 23,A%+224,ROW%(A%,1),ROW%(A%,2),ROW%(A%,3),ROW%(A%,4),ROW%(A%,5),ROW%(A
%,6),ROW%(A%,7),ROW%(A%,8)
1290 MOVE 192,847
1300 VDU A%+224
1310 ENDPROC
1320 REM ************************************************************ CALC
1330 DEF PROC_CALC(A%)
1340ROW%(A%,9)=0
1350FOR I%=1 TO 8
1360ROW%(A%,I%)=0
1370FOR J%=1 TO 8
1380IF GRID%(I%,J%)=A% ROW%(A%,I%)=ROW%(A%,I%)+(2^(8-J%)):ROW%(A%,9)=1
1390NEXT:NEXT
1400ENDPROC
1410 REM ************************************************************ VDU
1420DEF PROC_VDU
1430PROC_CALC(INK%)
1440COLOUR 7
1450FOR I%=1 TO 8
1460PRINT TAB(15,I%+1);"    ";
1470PRINT TAB(15,I%+1);ROW%(INK%,I%);
1480NEXT
1490ENDPROC
```

Rally racer

D T C Breslin,
Byfleet,
Surrey.

ATOM

HERE IS A program for the Acorn Atom which tests a player's ability to steer down a twisting lane. Using a combination of Atom Basic and resident assembler, the program uses under 2K of memory, and also graphic mode 2a — colour — so the screen RAM and floating point ROM must be fitted. The road is shown in a 3-D image as white dots and every time

(continued on page 181)

```
10 IF ?#99<>0 W=0;?#99=0
20 GOS.s
30 @=0
40 DIM LL5
50 F.J=0TO20;LL(J)=-1;N.
60 P.$21;F.J=1TO2;P=#2800
```

(listing continued on page 181)

"IT LOOKS NICE BUT WHAT THE HELL CAN I DO WITH IT?"

Every ZX SPECTRUM Print'n'Plotter Jotter has 100 pages of finely printed screen grids.

50 for the high resolution screen. 50 for the normal character screen.

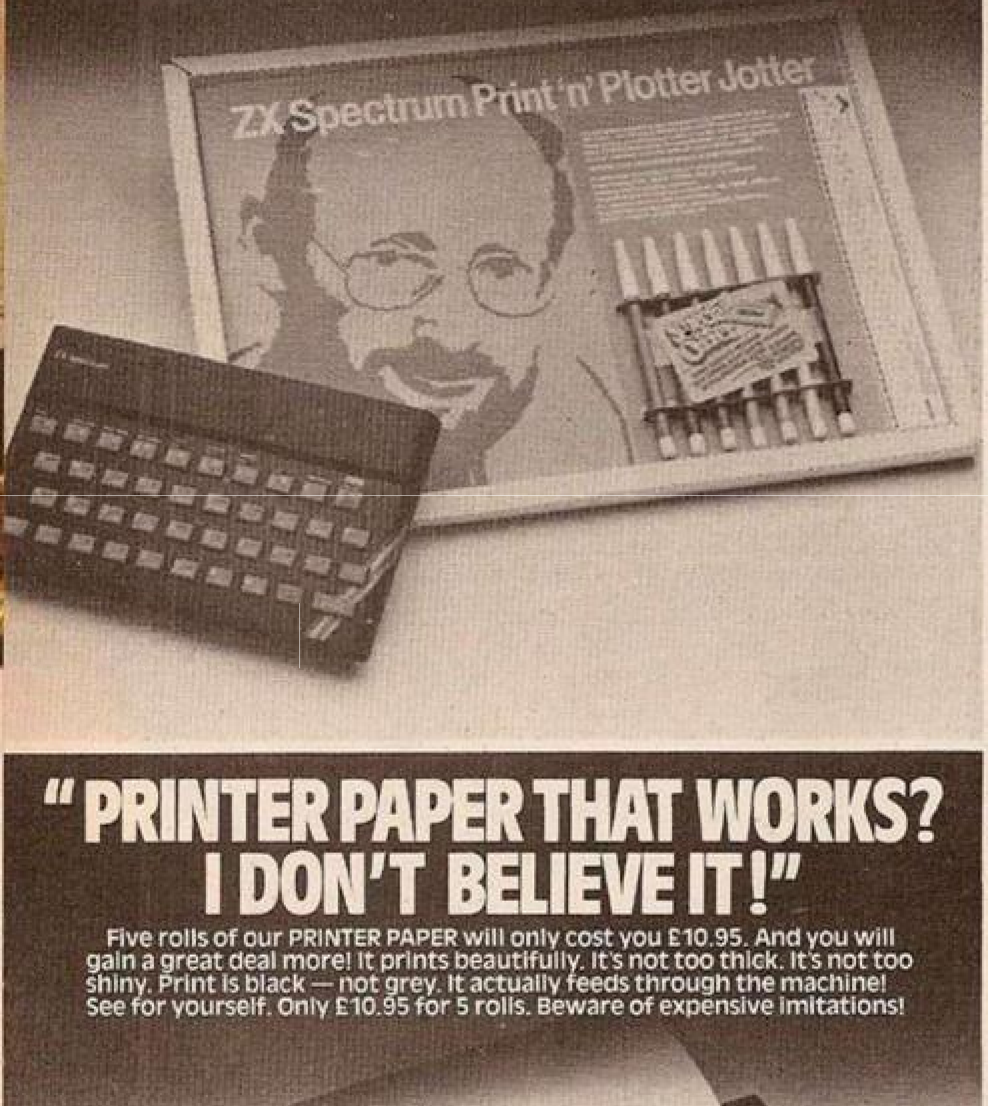
With these at your disposal you can plan practically any graphics print-out to program into your computer.

The high-resolution PLOT grid shows every one of the 45,060 pixels! Every one printed. Every one with its co-ordinate numbers. This gives you enormous graphics power to DRAW, PLOT, CIRCLE, PLOT OVER and so on in any position or screen building up graphic drawings, charts, maps . . . in fact anything without the complications of guesswork, integer out of range, or wrongly positioned pixel colours which change PRINTed INK characters!

The normal character PRINT grids on the other hand will allow you to be specific about PRINT AT, TAB, PRINT OVER, SCREEN$ and INK/PAPER in direct co-ordination with PLOT . . . you see every page is printed on **high quality tracing paper** . . . ideal to overlay on to illustrations and 'copy' or co-ordinate.

And there's another bonus, because each page contains 24 User-definable grids — **2400 per pad!**

With 50 pages of PLOT grids, 50 pages at PRINT grids 2400 user-definable grids, a set of colour pens, a printed PIXEL RULER and our Special Offer of demo programs, IT'S THE BEST VALUE IN ZX GRAPHICS PROGRAMMING.



"PRINTER PAPER THAT WORKS? I DON'T BELIEVE IT!"

Five rolls of our PRINTER PAPER will only cost you £10.95. And you will gain a great deal more! It prints beautifully. It's not too thick. It's not too shiny. Print is black — not grey. It actually feeds through the machine! See for yourself. Only £10.95 for 5 rolls. Beware of expensive imitations!



"NOW WHICH KEY DO I PRESS TO SHOOT DOWN THE THING FROM MARS?"

Ever forgotten which key to press when playing a game? Do you suffer from a mind-boggling mass of programmed keys? Do you write programs that use different keys to perform various functions? If so, we have just the thing for your ZX SPECTRUM.

A pack of Print'n'Plotter Keyboard Overlays.

Just write the function or functions under each key you program and keep the overlay for the next time you play the game. Of course there's lots of more uses you will find for our OVERLAYS, user defined characters, keyboard scanners, mathematical programs, business uses — to name just a few.

There's TEN OVERLAYS to a pack — so you can program with impunity! And they fit perfectly onto your standard ZX SPECTRUM KEYBOARD. Each OVERLAY is printed with the cursor movement key directions and there's room for program name etc.



"ZX81 GRAPHICS BETTER THAN SQUIGGLES AND BLOBS?"

Disappointed with ZX81 Graphics? Perhaps you haven't explored the vast possibilities.

Why not invest in a ZX81 JOTTER, FILM and our guide "ZX81 Graphics programming made easy"?

The JOTTER is a 100 page pad of PRINT grids and PLOT grids with all numbered co-ordinates. The FILM is a re-usable matt transparent polyester version of the grids which can be drawn-on and used again . . . ideal for overlaying and copying.

The 24 page full colour guide will show you how to use the JOTTER and FILM to produce perfect low resolution graphics on your ZX81!

So stop squiggling. Get a set now!



"WHERE CAN I GET THEM?"

Post now or call at one of our retailers!
Post to Print 'n' Plotter Products, 19 Borough High St., London SE1 9SE.

Name: ....

Address: ....

....

.... YA

...... ZX SPECTRUM JOTTER @ £9.95 each.
...... ZX SPECTRUM KEYBOARD OVERLAYS @ £2.95 per pack
...... ZX SPECTRUM DEMO CASSETTE @ 95p each.
...... ZX81 JOTTER PADS @ £3.50 each.
...... ZX81 FILMS @ £2.25 each.
...... ZX81 "GRAPHICS PROGRAMMING GUIDE" @ £1.50 each.
...... ZX PRINTER PAPER @ £10.95 per five rolls.

Remittance enclosed. Please bill my Access/Barclaycard/Visa/Mastercard No:

....

Please note: Price quoted include VAT, P&P for UK deliveries.
Overseas order please add 25% for additional Surface Mail.

You can see and buy most of our products at:
W. H. Smith (Computer Stores)
Buffer Micro (Streatham 01-769 2887)
Microware (Leicester 0533 29023)
Dennys Bookshops (London EC1 01-253 5421)
Personal Computer Services (Darwen Lancs 0254 776677)
Telford Electronics & Computing (Shifnall 0952 460008)
Georges Bookshop (Bristol 0272 276602)
Microtech Systems (Gillingham Kent 0634 571321)
Northampton Home Computer Centre (0604 47749)
Philip Copley Hi Fi (Ossett W. Yorks 0924 272545)
Darlington Computer Shop (Darlington 0325 487478)
Lancashire Micros (Morecambe Lancs 0524 411435)
North East Computers (Peterhead 0779 79900)
Photo-Video (Hereford 0432 267997)
Computers for All (Romford 0708 752862)

Print'n'Plotter Products

SOFTWARE FILE

(listing continued from page 179)

```
70[
 80 LL0 JSR LL3;LDA #9A;CLC;ADC #9B;STA #9B;STA #3B1F;STA#3A1F
 90 JSR #FE71;LDA @0;STA #90
100 CPY @1;BNE LL1
110 LDA #9E;STA #90;CLC;ADC #9B;STA #9B
120 LL1 CPY @3;BNE LL2
130 LDA #9F;STA #90;CLC;ADC #9B;STA #9B
140 LL2 LDA #B002;EOR@4;STA#B002;RTS
150 LL3 LDX @0;STX #5B;STX #5D;STX #5E
160 LL4 STX #5C
170 LDA #3A00,X;STA #5A;CLC;ADC #90;SEC;SBC @1;STA #39FF,X
180 JSR LL5;LDX #5C;LDA #39FF,X;STA #5A;INC #5E
190 DEC #5C;JSR LL5;DEC #5E;INC #5C
200 LDX #5C;LDA #3B00,X;STA #5A;SEC;ADC #90;STA #3AFF,X
210 JSR LL5;LDX #5C;LDA #3AFF,X;STA #5A;INC #5E
220 DEC #5C;JSR LL5;DEC #5E
230 LDX #5C;INX;INX;CPX @32;BNE LL4
240 LDA #87CE;ORA #87CF;ORA #87D0;ORA #87D1;STA #91;RTS
250 LL5 JMP(#3FE)
260];N.;P.$6
270 C=0;L=0;B=#B002;H=2;K=1;?#9E=1;?#9F=254
280hCLEAR2;COLOUR1;?#9B=64;!#87EE=-1;GOS.d
290 F.J=0TO32;J!#3A00=32+J;J!#3B00=96-J;N.
300 LI.LL3;F.J=0TO180;WAIT;N.
310aK=R.%H;?#9A=K;F.J=0TOA.R.%5+3;C=C+1
320 IF C%500=0;H=H+1;?#9E=H-1;?#9F=-H+1;GOS.d
330 LI.LL0
340 ?B=?B 4
350 IF ?#91<>0;?#15=?#15-1;G.9
360 ?B=?B 4;N.;G.a
370bP.$12"YOU SCORED "C" POINTS"''''
380 IF C>W;W=C
390 P."   HIGH SCORE IS "W'''''
400 P."PRESS [SPACE BAR] FOR ANOTHER GO"';LI.#FFE3;RUN
410gF.J=0TO200;?B=?B 4&R.;N.;L=L+1
420 IF L=3;G.b
430 G.h
440dP.$7;IF H=2;G.460
450 F.O=1TO H;MOVE((O-2)*2),61;DRAW(O-2)*2),63;N.
460 R.
470sCLEAR0;P.$30
480 F.J=35TO45;MOVE22,J;DRAW45,40;N.
490 P.''"             "$9"lombard"''''
500 P."STEER YOUR CAR AS FAR AS YOU CANDOWN THE ROAD BY THE"
510 P." KEYS :-"''
520 P." [ "$95" LEFT"''
530 P." ] "$95" RIGHT"'
540 P.''"   PRESS SPACE BAR TO CONTINUE"
550 LINK#FFE3
560 R.
```

(continued from page 179)

500 of these disappear off the bottom of the screen, the degree of difficulty increases until the player crashes three times. The score obtained and high score is printed and the game starts again.

Extra tools

Peter Barney, Letchworth, Hertfordshire.

SPECTRUM

USERS OF Bobby Rao's toolkit machine-code routines for the Spectrum — page 77, February, *Your Computer* — may find these routines useful also. List 3 and list 4 are high-resolution left and right scrolls, but in each case, the byte listed as 55 or 63 — use only one — will scroll with wrap-around if 63, or with a white pixel from left or right, as appropriate, if 55. This same byte Poked 0 gives inverse characters with wrap around.

List 1 and list 2 are high-res up or down scrolls, which may be of interest as they are much shorter — 53 and 55 bytes — than the 99 and 97 of the published routines.

I have given the listings in decimal as I find these far easier to enter than hexadecimal. A suitable routine for entering the codes is given on page 180 of the manual.

```
  5 REM Demo Program
 10 CLEAR (PEEK 23675+256*PEEK 23676-200)
 60 GO SUB 120
 65 IF INKEY$="i" THEN POKE 32533,0: POKE 32563,0
 70 IF INKEY$="u" THEN RANDOMIZE USR 32400
 75 IF INKEY$="w" THEN POKE 32533,63: POKE 32563,63
 80 IF INKEY$="d" THEN RANDOMIZE USR 32460
 85 IF INKEY$="s" THEN GO SUB 120
 90 IF INKEY$="l" THEN RANDOMIZE USR 32520
 95 IF INKEY$="x" THEN POKE 32533,55: POKE 32563,55
100 IF INKEY$="r" THEN RANDOMIZE USR 32550
105 GO TO 65
110 GO TO 150
120 FOR i=0 TO 21: FOR j=0 TO 31: PRINT AT i,j;CHR$ (133+j): NEXT j: NEXT i
125 PRINT AT 10,5;"Type u for up          ";AT 11,5;"    d for down        ";A
T 12,5;"    r for right       ";AT 13,5;"    l for left        ";AT 14,5;" and
 s for start again ";AT 15,5;"    w for wrap around,";AT 16,5;" i for inverse ";
CHR$ 34;"    ";CHR$ 34;"   ";AT 17,5;"    x cancels ";CHR$ 34;"    ";CHR$ 34;"
"
130 RETURN
```

LIST 4

```
32520  33    32521  255   32522  87    32523  6     32524  192
32525  197   32526  229   32527  221   32528  225   32529  221
32530  126   32531  225   32532  7     32533  55    32534  63
32535  6     32536  32    32537  203   32538  22    32539  43
32540  16    32541  251   32542  193   32543  16    32544  236
32545  201
```

LIST 3

```
32550  33    32551  0     32552  64    32553  6     32554  192
32555  197   32556  229   32557  221   32558  225   32559  221
32560  126   32561  31    32562  15    32563  55    32564  63
32565  6     32566  32    32567  203   32568  30    32569  35
32570  16    32571  251   32572  193   32573  16    32574  236
32575  201
```

LIST 2

```
32400  33    32401  31    32402  64    32403  84    32404  93
32405  37    32406  6     32407  3     32408  197   32409  6
32410  8     32411  197   32412  6     32413  8     32414  197
32415  36    32416  1     32417  32    32418  0     32419  237
32420  184   32421  17    32422  32    32423  0     32424  25
32425  84    32426  93    32427  193   32428  16    32429  240
32430  1     32431  32    32432  248   32433  9     32434  193
32435  16    32436  230   32437  62    32438  7     32439  132
32440  103   32441  193   32442  16    32443  220   32444  33
32445  223   32446  87    32447  6     32448  32    32449  35
32450  54    32451  0     32452  16    32453  251   32454  201
```

LIST 1

```
32460  33    32461  255   32462  87    32463  84    32464  93
32465  36    32466  6     32467  3     32468  197   32469  6
32470  8     32471  197   32472  6     32473  8     32474  197
32475  37    32476  1     32477  32    32478  0     32479  237
32480  184   32481  17    32482  32    32483  0     32484  25
32485  84    32486  93    32487  193   32488  16    32489  240
32490  1     32491  224   32492  7     32493  9     32494  193
32495  16    32496  230   32497  62    32498  249   32499  132
32500  103   32501  193   32502  16    32503  220   32504  37
32505  6     32506  32    32507  35    32508  54    32509  0
32510  16    32511  251   32512  201
```

The trap

Colin Hagreen, Orpington, Kent.

DRAGON

TRAP IS A game for two players, each player directing a line around the screen trying to force their opponent to hit one of the tracks formed or the boundaries of the court. Beware though as you can sometimes escape by cutting through a diagonal line. Be careful not to centre the joystick or you lose the game.

To start a game both players have to press the fire buttons. The overall winner is the first to score 10 wins. The lower-case letters in lines 350 and 360 are typed as inverse characters. PCopy is used to store the courts in another area of memory and lines 120 and 130 bring them on to the display faster than could be obtained by drawing them each time.

```
>   5 REM (C) C. HAGREEN '83
   10 PCLEAR6
   20 PMODE1,3
   30 PCLS
   40 LINE(0,0)-(0,192),PSET:LINE-(255,192),PSET:LINE-(255,0),PS
ET:LINE-(0,0),PSET
   50 PMODE1,5
   60 PCLS
   70 PCOPY3 TO 5:PCOPY4 TO 6
   80 LINE(50,50)-(50,150),PSET:LINE(200,50)-(200,150),PSET
   90 AS=0:CS=0
  100 GOTO 280
  110 X=RND(2)
  120 PCOPY(X*2)+1 TO 1
  130 PCOPY(X*2)+2 TO 2
  140 PMODE1,1:SCREEN1,0
  150 X=120:Y=90:X1=100:Y1=90
  160 X=X+2*(JOYSTK(0)>51)-2*(JOYSTK(0)<12)
  170 Y=Y+2*(JOYSTK(1)>51)-2*(JOYSTK(1)<12)
  180 IF PPOINT(X,Y)<>1 THEN 270
  190 PSET(X,Y,2)
  200 X1=X1+2*(JOYSTK(2)>51)-2*(JOYSTK(2)<12)
  210 Y1=Y1+2*(JOYSTK(3)>51)-2*(JOYSTK(3)<12)
  220 IF PPOINT(X1,Y1)<>1 THEN 250
  230 PSET(X1,Y1,3)
  240 GOTO160
  250 CS=CS+1
  260 GOTO280
  270 AS=AS+1
  280 CLS:PRINT"          T R A P":PRINT"          ----------"
  290 PRINT@128,"LEFT PLAYER          RIGHT PLAYER"
  300 PRINT@196,AS:PRINT@216,CS
  310 IF AS=10 OR CS=10 THEN 350
  320 PRINT" PRESS BOTH FIRE BUTTONS"
  330 IF PEEK(65280)<>124 AND PEEK(65280)<>252 THEN 330
  340 GOTO110
  350 IF AS=10 THEN PRINT:PRINT" left player wins" ELSE PRINT:PR
INT" right player wins"
  360 PRINT:PRINT:PRINT"  PRESS enter"
  370 A$=INKEY$:IF A$<>CHR$(13) THEN 370
  380 RUN
```

■

ADVENTURES WITH OVER 4,000 LOCATIONS

- Space Adventure
- Role Playing Adventure
- Single Player Adventure

Over 4,000 locations on one adventure cannot be done on one tape!

The first tape contains the graphics, the instructions, the preparation for travel and the first adventure. As soon as this adventure is finished you can order the next part. Please note that every part gives you at least two if not four different exits.

You can stop the game any time you like. It is however not possible to skip parts because data are recorded and you need these to continue.

There is always an option to restart when you found an exit, thus allowing you to find all the exits in any one module.

TYRANT OF GRAHAM: an adventure in outer space. Try and find your way to the planet Shrahaim. The approaches are heavily guarded but if you can get through you will find eternal life and the conquest of the universe is yours. Maybe (but we doubt it) you will find the way to another universe, but only if you enter the right black hole . . .

TREASURES OF MOSHT: a single player adventure in the most fabulous country ever put on computer. Try and stay alive in a place where everything seems to go against you . . .

TRAVELS IN RASHAN: a role playing adventure situated on earth before the cataclysms which happened before the precambrium era, some 600 million years ago. Travel through this ancient civilisation with its uncanny laws, stay alive and gather treasure. Then try and get back to your own time . . .

Each Adventure, Module 1: £4.50.
Each further module also £4.50.
Please add 50p per order for P&P.

ADULT WEEKEND

The game is played in a location where you might go to spend a weekend away from it all. You will meet other couples and decide what you want to do with your time.

If you want it neat and tidy then this is possible. If you want it adventurous and perhaps a bit promiscuous then you can have that too. Up to you . . .

If you a prudish then you can skip certain parts, if you are not then you can take the plunge. Try it, the best game for grown ups ever written. Naughty, romantic, sporty, even a bit dirty from time to time . . . **£7.00 + 50p P&P**

All Games for Spectrum 16K/48K and Atari 400/800 will be available for Dragon and Oric-1 in May.

COMMERCIAL SOFTWARE FOR SPECTRUM 48K

Financial modelling, budgetting and forecasting program.

All row and column arithmetic available. 13 cols. Rows dependant on memory used. The equivalent of 'Desk Top' or 'Micromodeller'' now available for your 48K SPECTRUM.

Inclusive of 45 page manual £30.00

Ask for information about our ledgers (nominal, sales, purchases) and other accounts packages (petty cash, bank reconciliation, etc . . .) which are only £20.00 each and come with a fifty page manual.

ASTROLOGERS

Computerise now on Spectrum 48K.
Full calculation program now available for Spectrum 48K. Ephemerides from 1900 to 2050 on different cassettes. Ask for full documentation.

YACHTSMEN and other SAILORS

Coastal navigation package now available for SPECTRUM 48K.
Celestial navigation available end of May.
Ask for full documentation now. £30.00

VENN SOFTWARE

133A High Street, Acton, London W3 6LY



A NEW DIMENSION MICRO-ROBOT

Robotics is a booming addition to microcomputing and now you can build yourself this inexpensive buggy type robot. Designed for use with most popular micros, including ZX81 and Spectrum, Zeaker will teach you about robot control, draw lines, explore, bleep, flash and even "learn" its way around; or just be a fun peripheral. A new dimension for computing.

For constructional data and kit availability see

PRACTICAL ELECTRONICS MAY 1983 ISSUE

ON SALE NOW! 85p

SOUND with SINCLAIR

MAKE AMAZING SOUND EFFECTS WITH YOUR ZX 81, TIMEX Sinclair 1000 or SPECTRUM



THE ZON X

£25.95
incl p&p & V.A.T.



- ★ The ZON X SOUND UNIT is completely self-contained and especially designed for use with the ZX 81, TIMEX Sinclair 1000 and Spectrum Computers. It just plugs in — no dismantling or soldering.
- ★ No power packs, batteries, leads or other extras.*
- ★ Manual Volume Control on panel — ample volume from built-in loud-speaker.
- ★ Standard Sinclair — 16K Rampack or printer can be plugged into ZON X Sound Unit without affecting normal computer operation.
- ★ Huge range of possible sounds for Games, Music, Helicopters, Sci-Fi, Space Invaders, Explosions, Gun-shots, Drums, Planes, Lasers, Organs, Bells, Tunes, Chords, etc., or whatever you devise!
- ★ 8 full octaves. Uses 3-Channel sound chip giving programme control of pitch, volume of tones and noises, all with envelope control.
- ★ Easily added to existing games or programmes using a few simple "BASIC" lines or machine code.
- ★ No memory addresses used — I.O. mapped.

FULL instructions with many examples of how to obtain effects and the programmes, supplied, fully guaranteed. British Made.

**Except with Spectrum, you need the Spectrum Extension Board Order No. SE1 — Price £6.80 incl. V.A.T.*

Payment may be made by Cheque. P.O. Giro No. 388 7006. Postal Order or Credit Card.

Export orders :— Bank Cheque. International Money Order. U.S. $ or £ Sterling.

YC5

BI-PAK Dept YC4 P.O. Box 6, 63A, High Street, Ware, Herts.

Access & VISA accepted Ring 0920 3182 for immediate despatch

COMPETITION CORNER

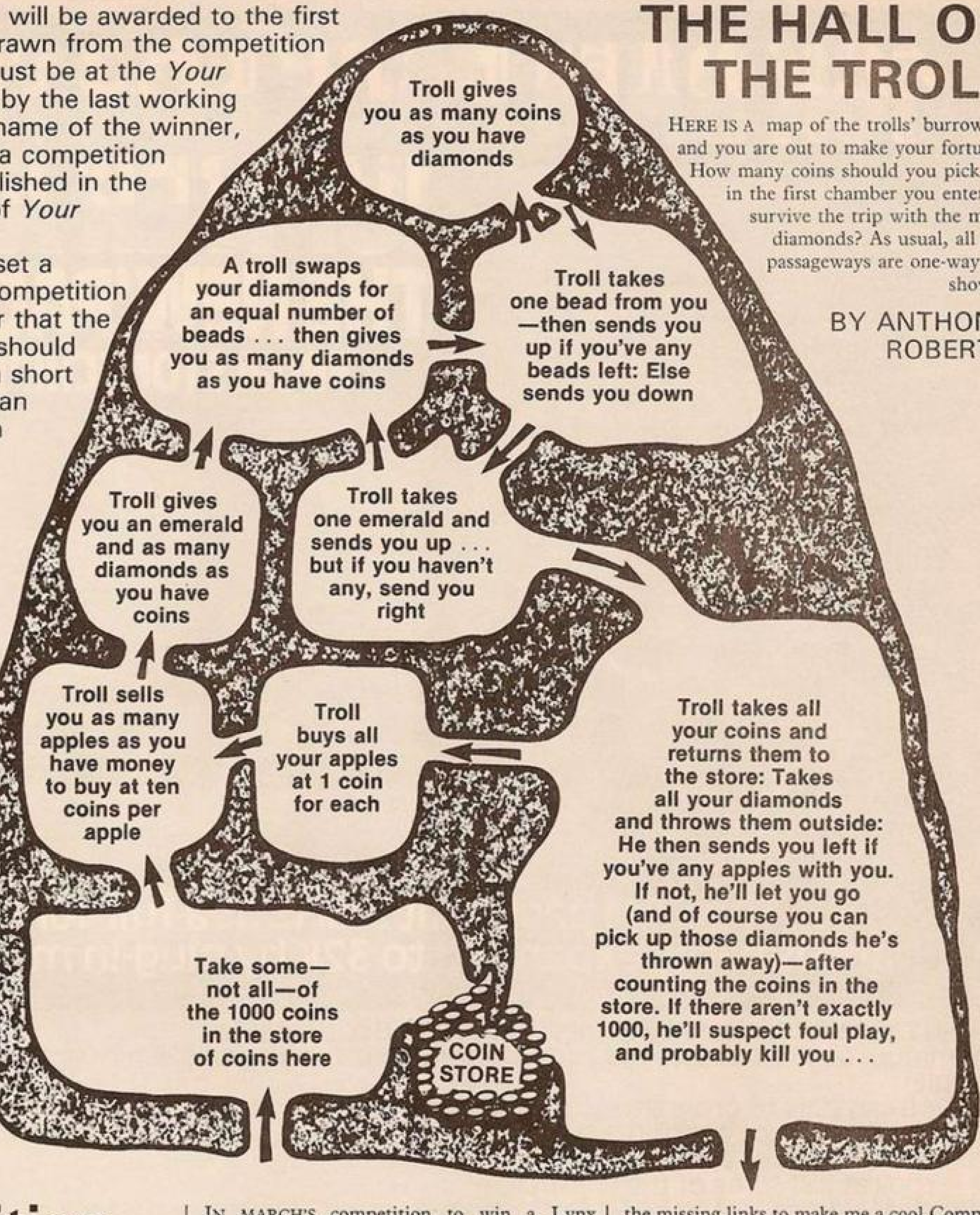
A £15 book token will be awarded to the first correct solution drawn from the competition bag. All entries must be at the *Your Computer* offices by the last working day in May. The name of the winner, the solution, and a competition report will be published in the July, 1983 issue of *Your Computer*.

If you want to set a competition for Competition Corner, remember that the simplest solution should be calculable by a short program rather than by any other form of reckoning.

THE HALL OF THE TROLL

HERE IS A map of the trolls' burrow — and you are out to make your fortune. How many coins should you pick up in the first chamber you enter to survive the trip with the most diamonds? As usual, all the passageways are one-way, as shown.

BY ANTHONY ROBERTS



Competition results

March solution.



IN MARCH'S competition to win a Lynx computer competitors were asked to complete the sentence, "A Lynx would bring out the animal in me because . . .".

The prospect of winning a Lynx may not have brought out the animal in everyone but it certainly brought out the punsters, in force. "I could relion my feline instincts for purrfect programming", wrote G Bockhurst, while H Howarth suggested "It's the big-byte cat-grrreat grrraphics and a purrfect purrocessor to boot".

The winning entry came from the appropriately-named Dave Bull, 86 Milton Road, Southampton, Berkshire, who wrote "It's the purrfect way to be an on-line feline".

Some of the other puns were more obscure. We are still trying to puzzle out A Ridley's "If ewe bison, ewe kangaroo terrier-bull byte otter it".

More straightforward were M Glass's "It's ears ahead", and from A Patrick, "It provides the missing links to make me a cool Computer cat".

Mrs Allemand struck a suitably aggressive note, worthy of Marvel comics, with "as Catwoman I'd have power over those ZX-81 jokers". E Jupp's entry, however, took a more relaxed line and confided owlishly "I wynx and blynx, but the Lynx thynx".

Our problem setter slipped up with the Telepathic Dangers competition by setting a problem which had not one but two solutions. Two pairs of segments can be discarded from the cube of On'ey: C and E, and B and F. Many of the entries spotted the blunder and gave both correct solutions.

We awarded the £15 book token to P Hoskins, 30 Springfield Park, Holyport, Berkshire.

He enclosed a program for the Spectrum which not only worked out the solutions but plotted the diagrams of the two possible cubes.

16K RAM PACK FOR THE JUPITER ACE

THE NEW 'PACER' FROM STONECHIP!



The RAM pack that starts at a full 16K and is easily expanded to 32K by plug-in module!

At last! The thing Jupiter Ace owners have waited patiently for.
A minimum of 16K RAM plus the added benefit of extending to 32K by a simple plug-in module!
Now you can start to program seriously in FORTH without the restriction of 3K RAM.
Make no mistake. Not only is the PACER the first RAM pack for the Jupiter Ace, it is a totally professional piece of equipment.

Look at just some of the features:—

*** 16K RAM expandable to 32K * Professionally cased to enhance the look of your computer * LED Power-on indicator * Wobble free connection — no loss of programs! * A fully tested product * Complete with 1 year's full warranty.**

The NEW "PACER" is available now direct from STONECHIP ELECTRONICS.
Write now for quick delivery by mail.
Remember: For more power from faster FORTH . . . you need a PACER!

only £29.95

DEALER ENQUIRIES WELCOME

POST TODAY to STONECHIP ELECTRONICS, Unit 9, The Brook Industrial Estate, Deadbrook Lane, Aldershot, Hants. (Telephone: 0252 318260)

Please forward me the following:—
...... "PACER" RAM packs for the Jupiter Ace @ £29.95.
...... 16K expansion modules (to expand "PACER" to 32K) @ £19.95.
I enclose full remittance of £............ made payable to Stonechip Ltd.
Please note: All prices include VAT, Post & Packing for U.K. deliveries (overseas add 15%)

Name:..

Address:.......................................

....

....

STONECHIP ELECTRONICS

"More ways to make more of your computer"

Delivery approx 14 days

VOLCANIC DUNGEON CHAMPIONSHIP

CARNELL SOFTWARE



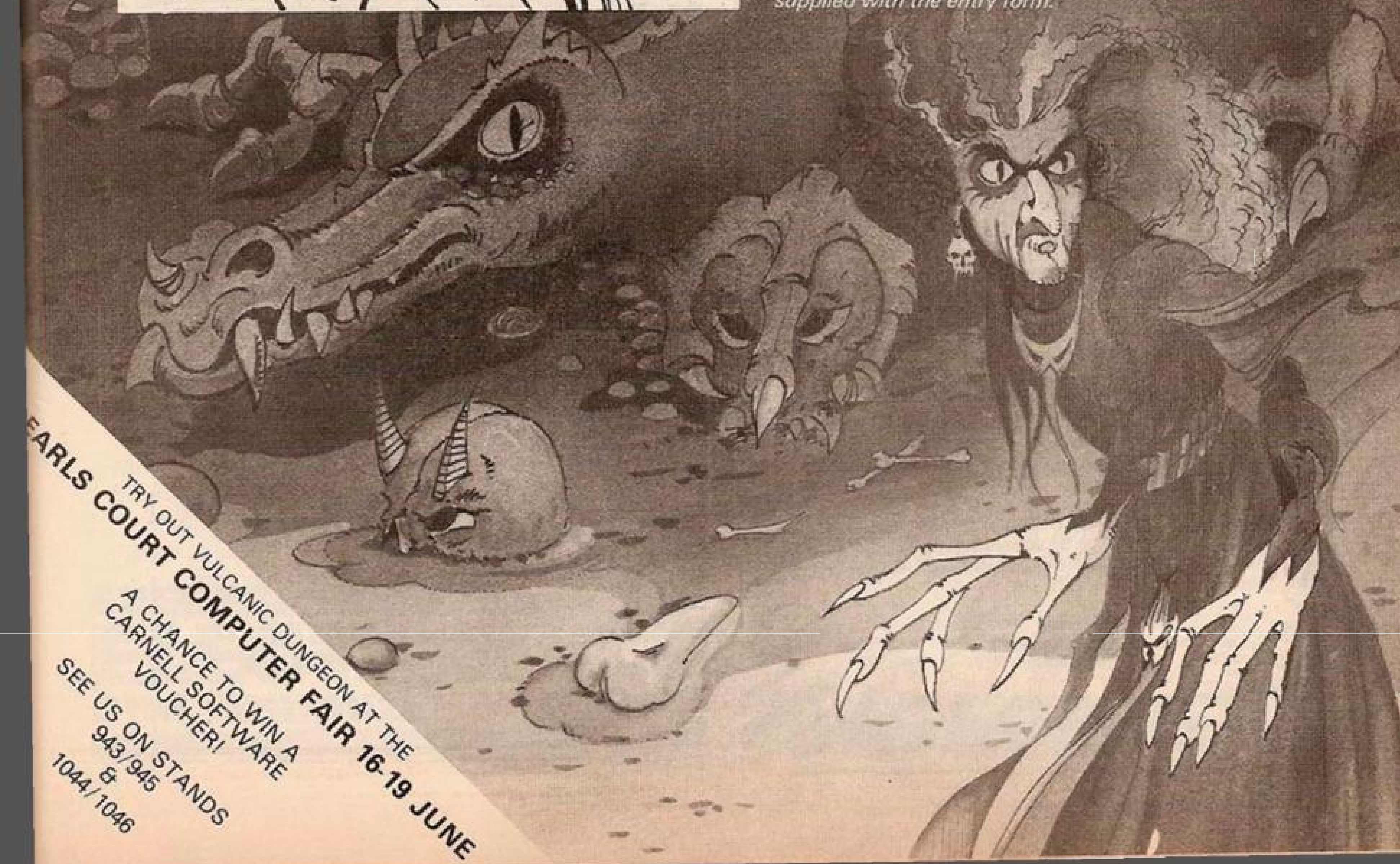
WIN A FABULOUS 'WINGS' HOLIDAY FOR 2 TO FLORIDA.

VISIT THE AMAZING NEW EPCOT CENTRE

Volcanic Dungeon, *the addictive adventure. People have* been known to venture into its maze of caverns to rescue the Princess Edora again and again. If you are one of them, or wish to be, then you could find yourself lying on a **sun-drenched beach in Miami for a week. Followed by a further week at Orlando,** visiting **Disney World** and **Epcot**. So what do you have to do for all this? **Just be the best Volcanic Dungeon player in the UK, that's all!** Ten finalists will battle it out in the championship at the London Computer Fair, Earl's Court, in June 1983. **But first you must prove you are worthy.**

Volcanic Dungeon is available on the **16K ZX-81, 48K Spectrum and Dragon 32.** An entry form is supplied with every game. (Anyone who already owns the original ZX version can enter by sending a SAE for an entry form.) **Order your copy NOW** from **CARNELL SOFTWARE, 4 Staunton Road, Slough, Berks. Only £5.00** including P&P. **Also available from good microcomputer stores.**

The 'Judges' decision is final and no correspondence will be entered into. All business associates of Carnell Software, and their relatives, are disqualified from entry. A copy of the rules of the Volcanic Dungeon championship will be supplied with the entry form.



TRY OUT VOLCANIC DUNGEON AT THE
EARLS COURT COMPUTER FAIR 16-19 JUNE
A CHANCE TO WIN A CARNELL SOFTWARE VOUCHER!
SEE US ON STANDS 943/945 & 1044/1046

'ALSO SEE ADVERT ON PAGE 160'

THE FLEXIBLE COMPUTER SYSTEM FOR THE FUTURE

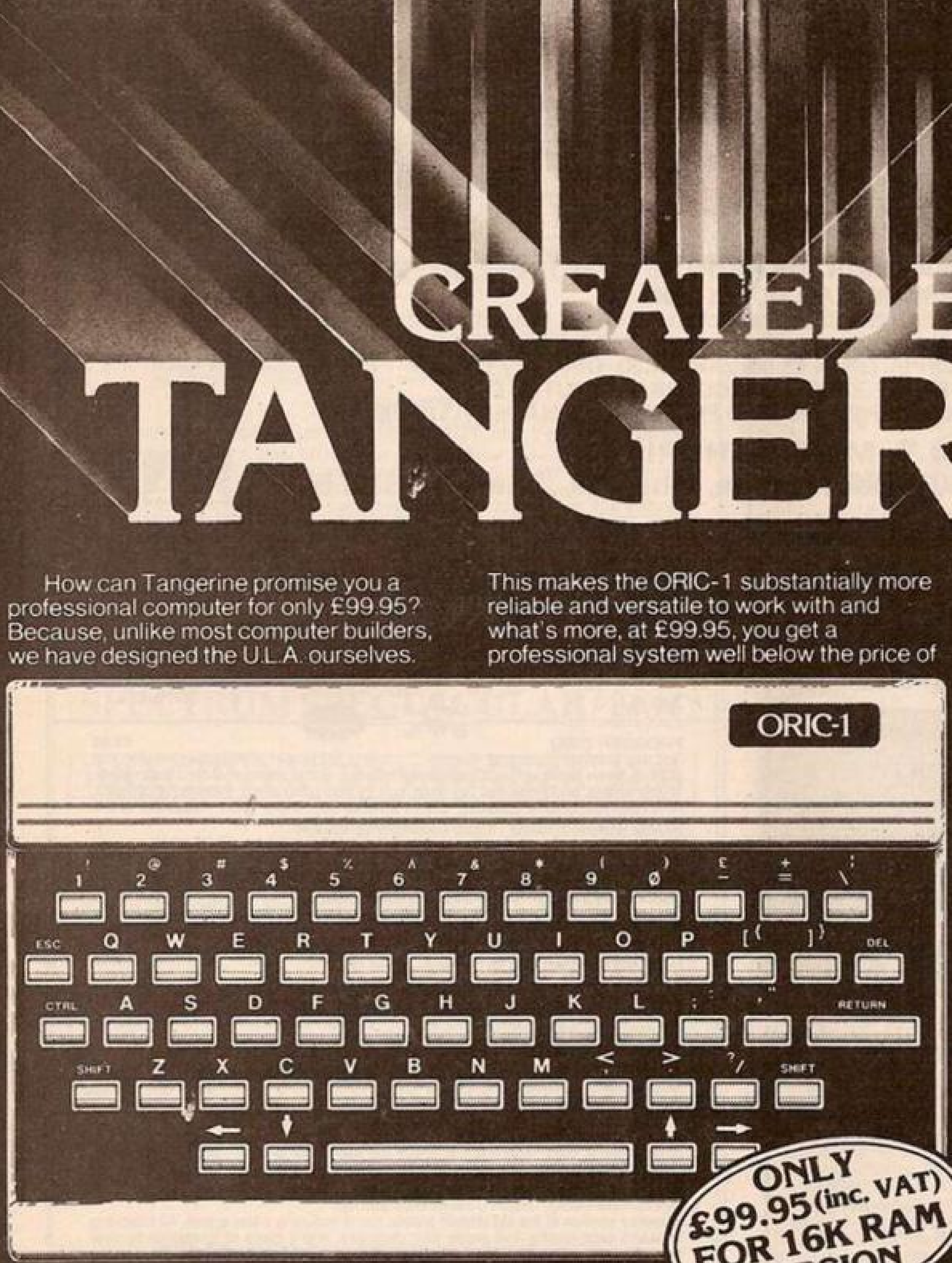
ORIC-1

CREATED BY TANGERINE

How can Tangerine promise you a professional computer for only £99.95? Because, unlike most computer builders, we have designed the U.L.A. ourselves. This makes the ORIC-1 substantially more reliable and versatile to work with and what's more, at £99.95, you get a professional system well below the price of all leading manufacturers.

We can give you prompt service, quality, reliability and full technical backup: The ORIC Computer System will guarantee you that and more:

- 8 colour graphic display (8 foreground + 8 background)
- 40 character by 28 line colour text display
- High resolution graphics (240/200 pixels) 240 across screen, 200 down
- 96 User defined graphics symbols
- Microsoft BASIC software
- 6 octaves of music with Hi-Fi output and 4 preset sound effects – Shoot, Explode, Ping, Zap
- Centronics printer interface (compatible with a whole range of standard printers)
- Optional Communications Modem (allowing access to 200,000 pages of Prestel and direct link with other computers)
- Typewriter style keyboard
- Professionally written user manual by well-known computer authors
- Oric Owner Magazine included with each ORIC 1 purchased
- Tan-Forth supplied free with every mail order 48K Model
- Extended Basic (BBC etc) available soon
- Full range of business and leisure software coming shortly.



ONLY £99.95 (inc. VAT) FOR 16K RAM VERSION

(Please allow 28 days for delivery) **Subject to availability**

Order your ORIC-1 direct from the designers

BY POST: You can pay by cheque, postal order, ACCESS – BARCLAYCARD-VISA

BY PHONE: Just ring our telesales number ELY (0353) 2271/2/3/4

Please delete/complete as applicable.
*I enclose a cheque/p.o. payable to TANGERINE COMPUTER SYSTEMS LTD. For £
Please charge my Access, Barclaycard, Visa No.

Name
Address

If you require a VAT receipt please tick ☐

Please send me a full colour brochure ☐

Item	Qty	Price Inc. VAT	Total
ORIC-1 16K RAM		£99.95	
ORIC-1 48K RAM		£169.95	
ORIC Communications Modem		£79.00	
ORIC Owner Magazine (Bi-monthly)		£10.00	
Postage and packing		£5.95	
		TOTAL £	

TANGERINE COMPUTER SYSTEMS LTD. 3 Club Mews, Ely Cambs CB7 4NW

SPECTRUM OWNERS!

SOFTWARE FOR A 16K OR 48K ZX-SPECTRUM

3D MAZE OF GOLD £5.95
Uses machine code to provide fast, full colour 3D perspective views as you scour the labyrinth for GOLD. Look lively and find the exit or your gold may well be worthless! Ten levels of play all great fun. This is our most popular program. Kempston Joystick compatible.

Magic Castle £4.95
48K Spectrum machine code adventure. Rescue the Princess from the Magic Castle, beware of the Vampires.

GAMES TAPE 1 .... £4.95

MONGOOSE
Fast m/c action, in colour as you try to save your snake from the voracious Mongoose, don't dare pause! Your snake grows by eating the falling apples in the orchard. Faster and harder on every frame, superb graphics.

BEAR ISLAND
Trapped in the Arctic, can you survive when each ice flow has even more bears than the last? A fast arcade style, strategy game. Making full use of all the Spectrum features it is highly exciting and much acclaimed by all.

GAMES TAPE 2 .... £4.95

REVERSI
This game provides a chance to pit your strategic abilities against those of the computer or another player. The version provides machine code thinking speed and plays a good game. Includes audible and visual indication of moves made.

POKER DICE
Gamblers beware! The use of hi-res graphics, colour and sound together with a clever "hand" recognition system, makes this an addictive gamling game. You could win a fortune, you might lose your shirt, but roll, roll, roll those dice.

GAMES TAPE 3 .... £4.95

TIME-LINK
A feat on the 16K machine as it **TIME-LINE** full textual type adventure with a maze. Written in 100% m/c for speed. You must find your time machine to return to the present, beware the gas!

TASKS
A new concept in graphical adventures. Collect all the treasure from within the maze by solving all the problems set by the TASK-MASTER. All the tasks given will stimulate your mind.

WHITE NOISE & GRAPHICS £5.95
Designed to overcome the limitations of Spectrum BASIC, WNG gives you over 20 extra commands to give; explosion sound effects, total screen control using a window which can be scrolled in any direction cleared, inverted, shaded and bordered. Uses BASIC variables (no POKEs needed), and named USR calls. Includes extensive manual.

CESIL £5.95
A low cost, full implementation of this popular 'O' level teaching language, invaluable to students and teachers alike. Includes a comprehensive manual, tape load and save, editing etc. It is available for the SPECTRUM, 16K ZX81 and now for the DRAGON 32.

GILSOFT

30 Hawthorn Road, Barry, S.Glam. CF6 8LE Tel. 0446 736369

S.A.E, for full details of these and other items.

RETAILERS INCLUDE: CARDIFF, Microcentre, Randall Cox; BARRY, Bytewell; YORK, Garnett Computer Services; BRIGHTON, Gamer; MORLEY, Dragonbyte; IVYBRIDGE, Ivysoft; PORT TALBOT, jay Dee Communications. Also by mail from The Software Supermarket, LONDON, EXETER SOFTWARE.

ENTERPRISE TECHNOLOGY LTD

NEW

ZP-4000

EPROM PROGRAMMER

Converts the ZX81 computer into a powerful development aid. Operating software in prom for fast immediate operation. Many useful facilities. Neatly plugs between ZX81 and Rampack. For +5v 2516/2532 type eproms.

BUILT AND GUARANTEE

Order as ZP-4000 £57.95 inc. p + p

Cheque or P.O. only to:

ENTERPRISE TECHNOLOGY LTD.
P.O. BOX 140, DEPT CY,
WIGAN, LANCS, WN3 6LF, ENGLAND

SPECTRUM SPECTACULAR £4.95

DRAGON EXTRAVAGANZA £4.95

Two new books by Roger Valentine. Each containing a mammoth 50 programs (for the Sinclair Spectrum and Dragon 32 respectively).

From the publishers of:

WHAT CAN I DO WITH 1K? £4.95

WHAT CAN I DO WITH 16K? £4.95

The two best program books for the Sinclair ZX81. Available from your bookshop, or

V&H COMPUTER SERVICES
182c Kingston Road, Staines, Middx.
Tel: Staines 58041

BUSINESS USERS PLEASE NOTE: OUR **PAYROLL** PROGRAM IS NOW AVAILABLE FOR: **ZX81, SPECTRUM,** PET, BBC, KONTRON AND SOON **DRAGON PLEASE** WRITE FOR DETAILS OR SEND **£2.00** FOR COMPREHENSIVE MANUAL (SINCLAIR VERSIONS ONLY)

NEW

THE GREATEST PROGRAMMING AID SINCE FINGERS



Cuts Down Program Entry Time

- *How many hours do you spend de-bugging programs?*
- *How many times have you traced a bug to a typing error?*
- *How many times have you wished for another pair of hands to keep your place in program listings?*
- *How many times have you had back-ache, neck-ache and eye-strain through copying listings at uncomfortable angles?*

THE EASIREADER FROM BUGBEAR

Saves Hours in De-bugging time

- Over 99% of bugs in programs copied from printout listings are the result of entry errors — errors anyone with only one pair of hands can make. Even one mistake can take hours to trace.

The EASIREADER Minimises Bugs by Minimising Entry Errors

- The attractive perspex stand can be positioned where most comfortable, avoiding stiff necks and aching backs... strain causes mistakes!
- The specially designed cursor prevents skipping between complicated and similar-looking lines while allowing you to 'read through' simple lines.
- The **EASIREADER** keeps your place for two-handed keyboard entries, i.e. when using a Sinclair computer or just using the 'shift' key.
- It will even scan the off-horizontal listings found in many magazines.
- The **EASIREADER** can handle all normal magazines up to A4 size, single sheets, computer printouts and most books.

HELP BANISH BUGS
Make your programming easier and more comfortable.
SAVE TIME AND EFFORT – AVOID FRUSTRATION

Send for your **EASIREADER** now at a special introductory price of **£12.99**. Please add £1.25 p&p.

BUGBEAR, DEPT. YC 2, NICHOLSON BUILDINGS, TEMPLETOWN, SOUTH SHIELDS. TYNE & WEAR NE33 5RZ.

© BUGBEAR 1982 Patent Pending No 8232718

CHROMASONIC
PERSONAL COMPUTERS

Buy it with Access — VISA

the Home Computer Specialists

01-263 9493/5

48 JUNCTION RD, ARCHWAY, LONDON N19 5RD Telex 22568

INTRO OFFER! VIC 20+
* Cassette deck
* "Intro to Basic" part 1
* Joystick
* 5 Blank cassettes

£199

VIC 20 COMPUTER

NEW LOW PRICE £149.00



VIC PRINTER £212.00
80 Characters per line, 30 Characters per sec., Tractor Feed Dot matrix printer.

VIC SINGLE FLOPPY DISK
OUR PRICE **£286.00**
174K Byte Storage Direct Interface to VIC Direct Compatibility with printer.

VIC CASSETTE DECK £39.00
Free cassette with 6 programs supplied

**** NEW **NEW** NEW *****

JUST RELEASED

The64 from commodore

64K RAM

music synthesiser

3-D effect

16-colour display

OUR PRICE **£339**



ACCESSORIES FOR YOUR VIC20

Super Expander High Resolution Cartridge **£31.00**
Programmers Aid Cartridge **£28.00**
Machine code Monitor Cartridge **£28.00**
8K RAM Cartridge **£39.00** 16K RAM Cartridge **£67.00**

TONS OF SOFTWARE
For a copy of our VIC list containing everything you need for the VIC computer, send us your coupon NOW!

COLOUR GENIE

EG 2000
PAL VERSION
* 8 colours
* 16K RAM standard, expandable to 32K
* Extended Microsoft colour basic standard
* Typewriter Keyboard
* CPU: Z80A/2.2 MHz
* 3 Sound Channels
* 40 Columns x 24 Lines
* Serial and Parallel I/O Ports

OUR PRICE **£199**



***** STOP PRESS *****
VIC 20 GAMES

CARTRIDGES	VIC1905	"JELLY MONSTERS"	£18
	VIC1914	"ADVENTURELAND"	£23
	VIC1917	"VOODOO CASTLE"	£23
CASSETTES	VIC3501	"QUIZMASTER"	£10
	VIC3502	a) "KNOW YOUR OWN IQ"	£10
	VIC3511	BBC "MASTERMIND"	£10

Post to CHROMASONIC Personal Computers,
48 Junction Road, Archway,
LONDON N19 5RD

TERMS OF BUSINESS: All prices inc 15% VAT
Delivery charged at Cost. Prices valid for cover date of this mag.
Access and Barclaycard orders welcome.

I am interested in a home computer.
Please send me further
☐ VIC 20 ☐ DRAGON 32 ☐ COLOUR GENIE
☐ ADD-ONS ☐ SOFTWARE

NAME: ....

ADDRESS ....

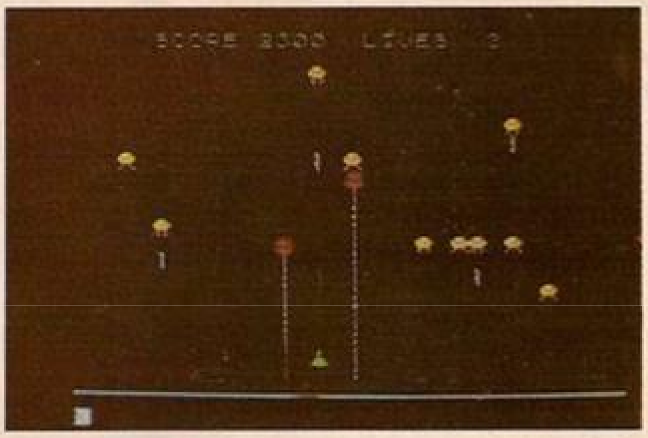
....

Please send me game No. ....
I enclose cheque/postal order for £........

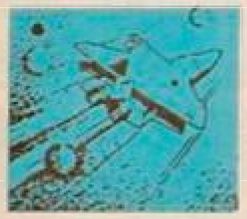
THIS IS THE AGE OF

C☆TECH

HOME COMPUTING

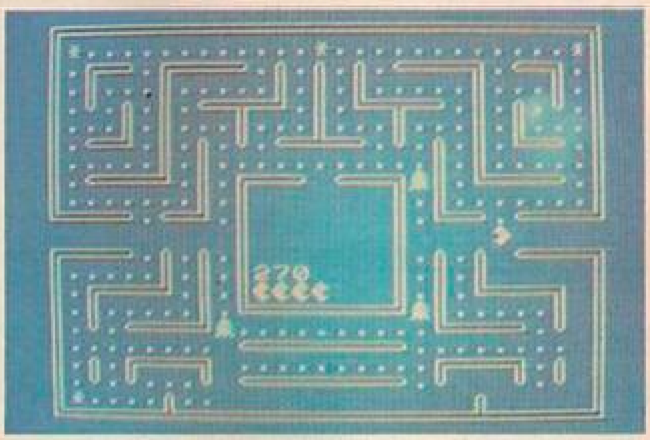


ZX Spectrum SOFTWARE



GORFIAN

GORFIAN INVADERS. A Superb 4 screen machine code program with Invaders, Galaxians, Firebird and Flagship. Multicoloured Hi-Resolution graphics and Sound Effects.
For the 48K Spectrum, price £5.50



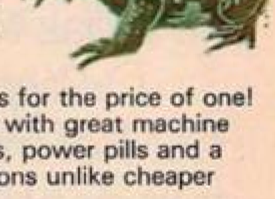
KRAZY KONG

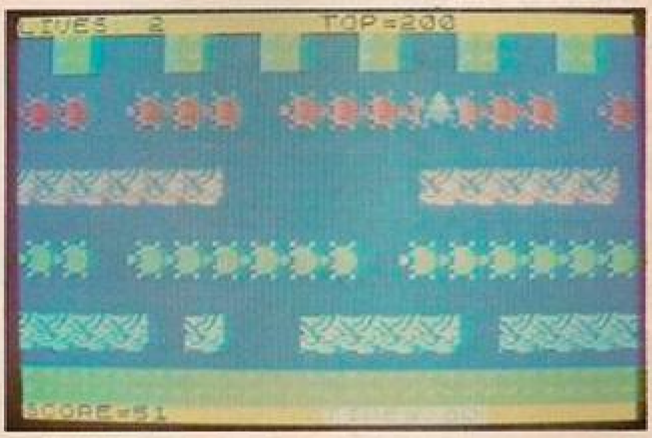


KRAZY KONG. Another 100% machine code program, featuring 3 Screens of Hi-Res Gorilla, Barrels, Fireballs, Lifts and a Running and Jumping man who must rescue his girlfriend from the enraged KONG! For the Spectrum, price £5.50



SPECMAN & FROGGER





FROGGER AND SPECMAN. two excellent games for the price of one! SPECMAN is probably the best version of it's type with great machine code graphics and sound effects with 3 to 5 ghosts, power pills and a real munchie man who munches away in all directions unlike cheaper versions!
Frogger, is a 2 screen superb representation of this arcade classic and has full colour Hi-Res Frogs, Cars, Roads, Logs, Turtles and Riverbank. Plus Super sound effects.
Both on one cassette for the Spectrum, price £5.50.

CENTIPEDE

CENTIPEDE AND PAINTER
By the time you read this our latest release for the Spectrum should be available . . . . . .
Centipede is a full colour machine code arcade game where the object is to defend yourself with your Laser against a fast moving centipede which weeves in and out of the mushroom patch. There are other versions of this game but we think you'll prefer ours because we always strive for an extra dimension of realism, which makes all the difference!
Painter, is another well loved Arcade game here you must paint in between the numbers on a multicoloured screen before you have to overlap.
Price for SPECTRUM is £5.50.

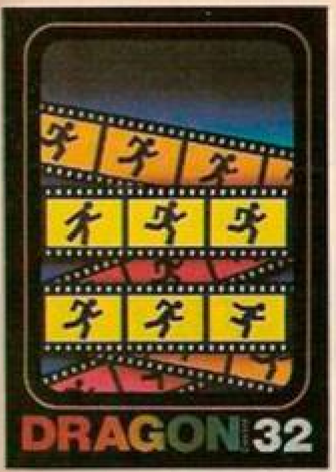
HOW AND WHERE TO GET C☆Tech Software PRODUCTS
There are three ways to get the tape that you require, firstly you can go to one of around fifty retailers in the UK and some more overseas, there is at least one in every town and several in major cities.
Secondly you can ring our Telesales on 061-366 8223 and Alison or Shirley will take your order and tell you of any other games you might be interested in.
Last the most popular way is to simply clip the coupon and send it to us at:
C☆Tech, 184 Market St, HYDE, CHESHIRE, SK14 1EX.

PLEASE SEND ME THE FOLLOWING: ....

MY NAME AND ADDRESS IS, ...

Postcode, ...

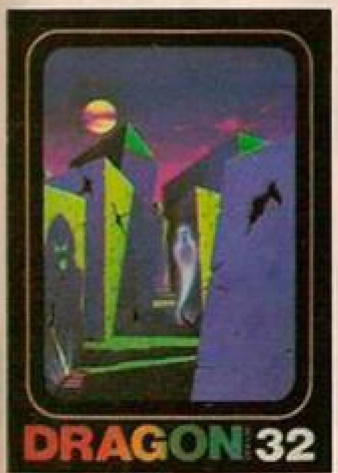
I ENCLOSE .... £......



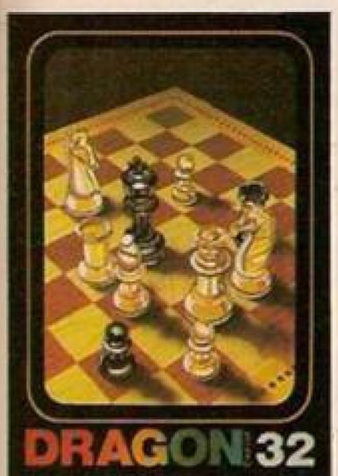
Graphic Animator. A cassette that makes use of the Dragon's ability to draw on the screen. It shows you how to create simple cartoons - then bring them to life.



Personal Finance. This cassette allows you to keep track of all the family's finances, from bills to bank statements.



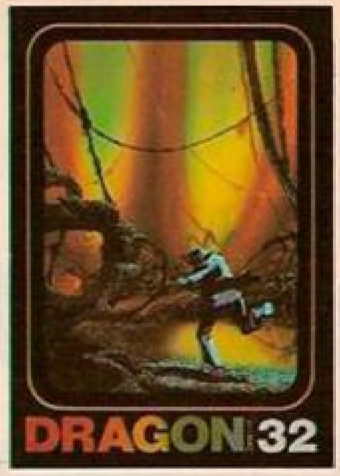
Ghost Attack. On cartridge. You're in a maze, and you must find your way out. But you're not alone - you're pursued by ghosts!



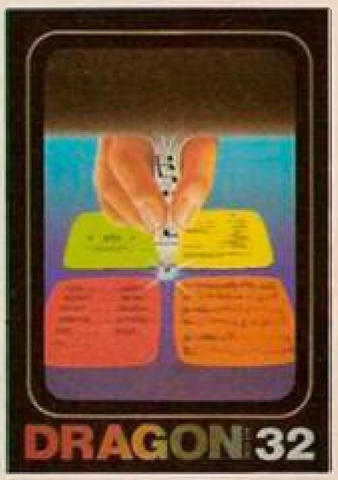
Chess. A great partner to play against again and again - with one major drawback. It's very hard to beat. Test yourself against nine different levels. On cartridge.



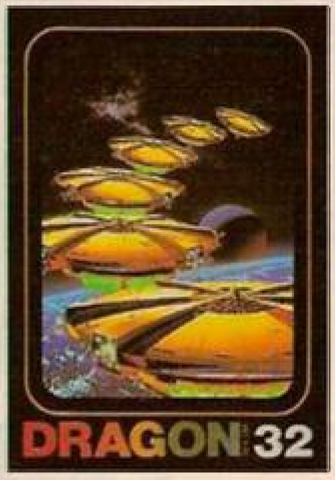
Typing Tutor. Only a keyboard as sophisticated as the Dragon's could allow you a program like this. You use the Dragon's own keyboard to learn to type. On cassette.



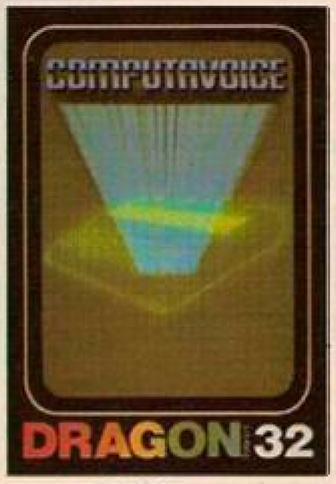
Cave Hunter. Finding the hidden gold is hard. But surviving the attacks of malevolent creatures may well prove to be impossible. Cave Hunter is on cartridge.



Dragon Selection. A cassette of utility programs, allowing you to create your own database. Write your own tunes - or learn other language vocabularies.



Starship Chameleon. A cartridge game. You find yourself under attack by the dreaded Gabolators! Their task is to take your planet - yours is to protect it.



Computavoice. This cassette actually enables your Dragon to speak to you.

These are just some of our titles, and every month, we'll be adding more and more.

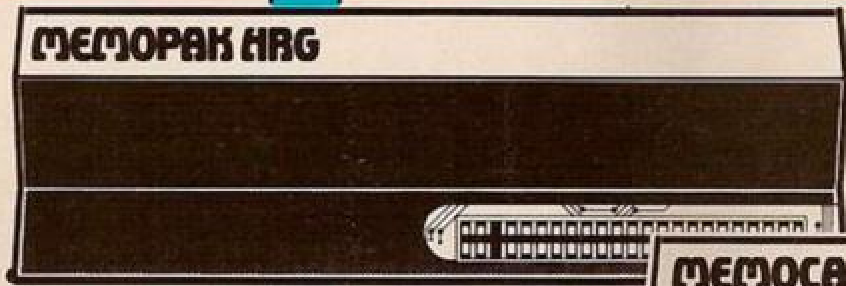
What you get out of a computer depends on what you put in. And with a Dragon 32 and Dragon software, there's enough challenge and satisfaction for anyone. But then, that's what it's designed for.

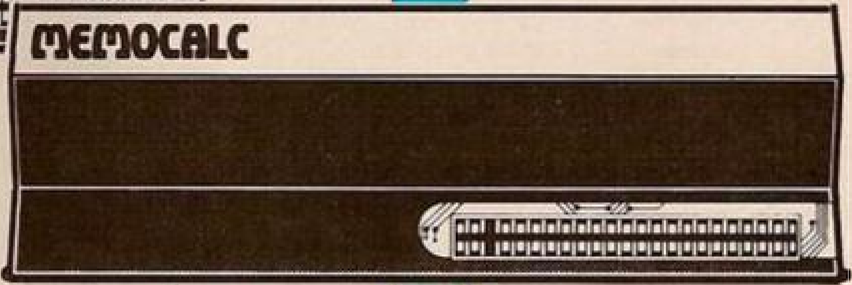
DRAGON 32

The first family computer.

otech,
tial of your ZX81...

MEMOCALC The screen display behaves as a 'window' on a large sheet of paper on which a table of numbers is laid out. The maximum size of the table is determined by the memory capacity, and with a MEMOPAK 64K a table of up to 7000 numbers with up to 250 rows or 99 columns can be specified. Each location in the table can be either a number which is keyed in or a formula which generates a number.
£29.90 inc VAT



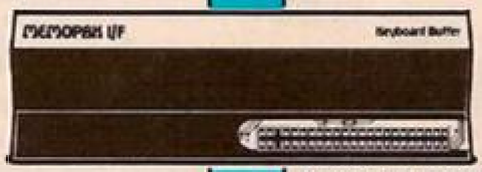


MEMOPAK HRG This pack breaks down the constraints imposed by operating at the ZX81 character level and allows high definition displays to be generated. All 248 × 192 individual pixels can be controlled using simple commands, and the built in software enables the user to work interactively at the dot, line, character, block and page levels. Scrolling, flashing and animation are all here.
£39.90 incVAT



MEMOTECH KEYBOARD
The Memotech plug-in Keyboard plus buffer pack takes the effort out of data entry for ZX81 users. The Keyboard has a light professional touch and is housed in an elegant aluminium case. The simple plug-in system means that you are not obliged to open up your ZX81, use a soldering iron or invalidate your ZX81 warranty.
£49.95 inc VAT





KEYBOARD BUFFER PAK
The Buffer Pak performs a "housekeeping" function for the Keyboard, interfacing directly with the port at the back of your ZX81.

via a light-touch keyboard, construct and label graphs, and then copy the screen to an 80-column printer. Only 16K of memory is shown here but with additional memory, more than one video page can be stored. Up to 7 pages can be displayed in rapid succession to give animated displays.

Looking forward, **Memotech** will continue to back the ZX81 through 1983 with fast storage devices, pressure sensitive electronic drawing boards and more software packs including a **Wordprocessor**, an **RS232 Interface** and a **Z80 Assembler**.

MEMOTECH products are available from major branches of W.H. SMITH'S & JOHN MENZIES

To: Memotech Limited, Witney, Oxon, OX8 6BX
Tel: Witney 2977, Telex 83372 Memtec G
Please send me the following Memotech products:

Please add £2.00 per item to cover post and packing

I enclose a cheque/P.O. for ________
or please debit my Access/Barclaycard account number

Signature ____________________ Date ______

Name and Address ____________________

KAYDE

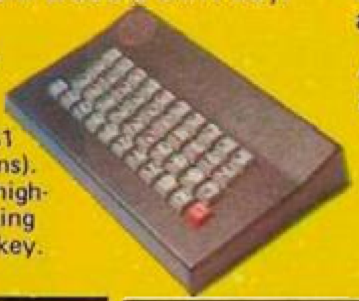
KEYBOARDS – For the ZX81 and Spectrum.

Features include
ZX81 Repeat key and Spectrum Double shift key.

All keyboards are 'electric typewriter' quality, full size and are fully built and tested. They allow you to use all other add-ons. No extra power is needed. Fully guaranteed.

A fitting service is available for all our keyboards and costs £4.00 including postage and packing. Send for details.

Kayde Standard Keyboard
This is used for both computers, but does not accomodate them inside the casing. Open your computer and plug in the connector. (The ZX81 requires two simple solder connections). The keyboard comes complete with high-impact black plastic case and full fitting instructions. The ZX81 has a repeat key.
£37.95



Kayde Super Plug-in Keyboard
This is the ultimate keyboard for your Sinclair computer, you simply plug it into the user port at the back. No disassembling. Complete with full-size space bar and ZX81 repeat key. **£49.95**

Kayde Deluxe Keyboard
This keyboard is also used for both types of computer but allows you to fit your computer inside. It also has a full size space bar and a ZX81 repeat key. The Spectrum version needs no soldering, the ZX81 two simple solder connections.
£45.00



RAM Packs
All Kayde RAM Packs use state of the art technology and feature top-quality, low power memories. Housed in high-impact polysterene, they look good and are fully tested and guaranteed.

Kayde ZX81 64K RAM Pack
Totally the same design as our 16K but giving you a massive 64K turning your machine into a very powerful computer **£59.95**

Kayde ZX81 16K RAM Pack
Low power feature allows you to use all other add-ons including ZX81 printer without wobble, overheating or memory loss. You should only have to buy one RAM Pack for your ZX81 so buy the best at the beginning and save yourself unnecessary problems.
£29.95

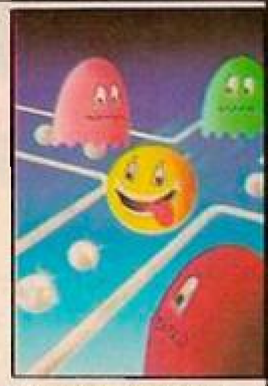
Kayde Spectrum 32K RAM Pack (Issue II)
This brings your Spectrum up to a full 48K. It is easily fitted, and comes as a kit with RAM chips that slot into existing connectors. No soldering necessary. **£35.95**

NEW! **Kayde Spectrum 32K Plug-in RAM Pack**
The same design as our 32K RAM pack kit, but simply plugs in the back of your Spectrum. No need to open your machine. **£44.95**



Kayde 4K Graphics ROM Pack
This comes complete with a pre-programmed 4K Graphics ROM to give you an extra 450 graphics. The board has facilities for either 2K of RAM (for user definable graphics, 4K of RAM or our 4K Tool Kit. The entire board fits neatly inside your computer.
A free fitting service is available on request.

4K Graphics Board	£29.95
4K Tool Kit	£9.95
2K UDG ROM and Character Generator Cassette	£10.95
16K Graphic Software Peckman*	£5.95



* Can only be used with 4K Graphics Board.

Kayde Spectrum Sound Module
This module fits neatly inside your Spectrum and lets the sound come through the more powerful speaker on your television rather than the Spectrum. No soldering required. **£9.95**

Newsflash!! **Kayde Software**
The Valley
Available for 16K VIC 20, Dragon 32, New Brain and Oric
This is an exciting real time adventure. You can be a wizard, thinker, barbarian, warrior or cleric depending on your mood. Each character has its own strengths and weaknesses.
You fight fearsome monsters, meet exciting challenges, solve mind-bending riddles in the most involving adventure game yet. **£9.95**

Kayde Keys (VIC 20) This program runs on just 300 bytes and gives you the use of function keys and characters on a VIC 20, there are over 25 commands at your disposal. **£6.95**

Design/Restore (VIC 20)
A complete system to enable you to create your own characters. Also includes restore program to load characters into your VIC. Three character sets included. **£9.99**

SOFTWARE WRITERS WANTED
If you want the best deal for your original programs then send a copy to us for review. We offer highest royalties, security and marketing. Don't forget to include a description of the program and for what machine it is intended.
Mail Order Lists
For full mail order lists write to the address below.

We offer the fastest delivery time of all times.

Mail Order + Showroom
Kayde Electronic Systems Ltd.,
The Conge Great Yarmouth
Norfolk NR30 1PJ Tel: (0493) 55253/57867

New London Showroom
Kayde Home Computers Ltd
1 Station Approach
New Eltham London SE9 Tel: 01-859 7505

Dealer Enquiries to:–
Zone Distribution Ltd.
13 Old Court Long Melford
Sudbury Suffolk Tel: (0787)312234

ALL MAIL ORDERS
TO: KAYDE ELECTRONIC SYSTEMS LTD,
DEPT. WM2, THE CONGE, GREAT YARMOUTH,
NORFOLK NR30 1PJ

PLEASE PRINT AND STATE TYPE OF COMPUTER

Qty	Item	Item Price £	Total £

Please allow £2.00 P&P for all Hardware 50p for all software

DON'T FORGET YOU CAN ALWAYS ORDER ON THE TELEPHONE WITH YOUR CREDIT CARD. DEALERS WELCOME. YC 5

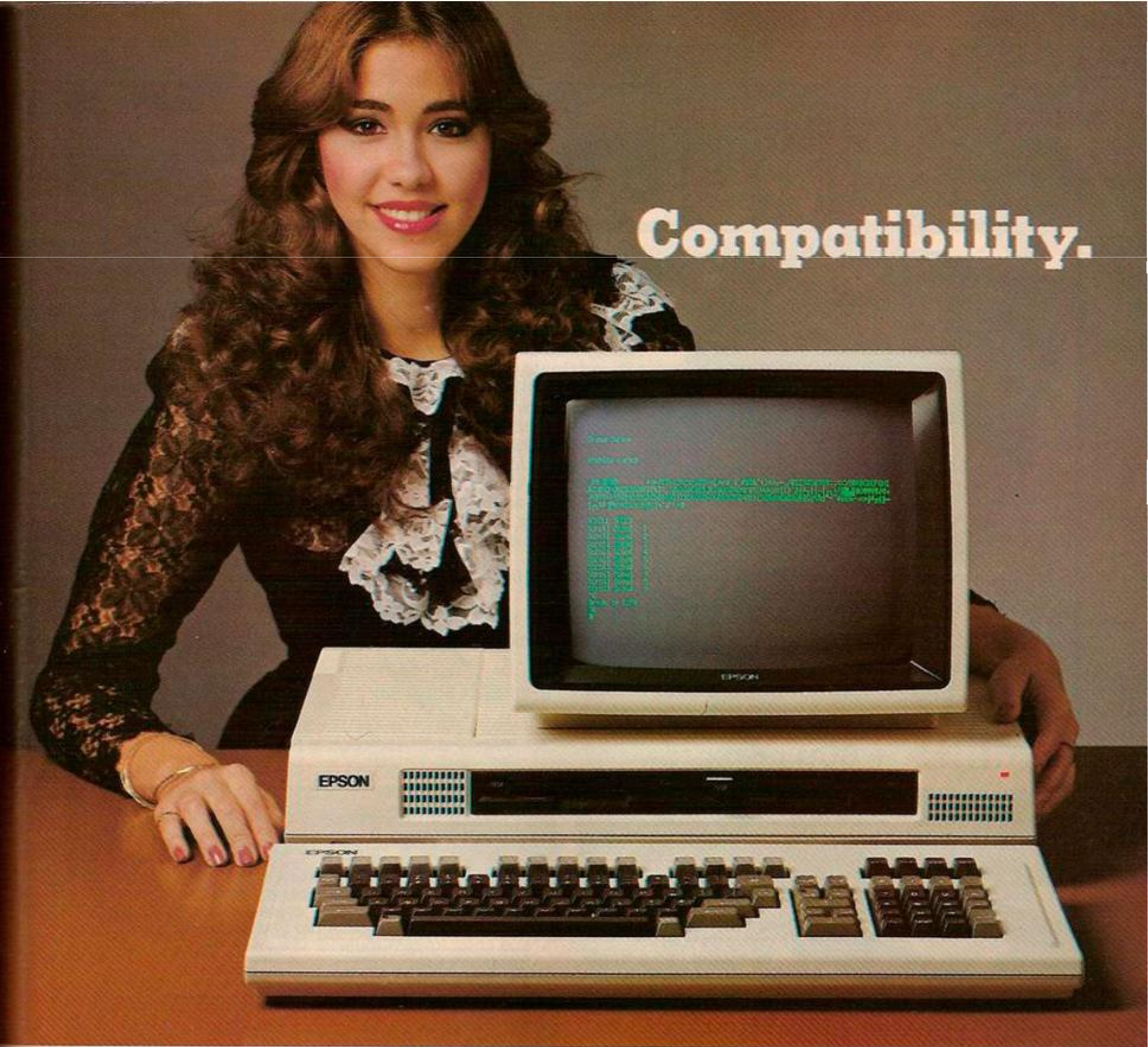
*I enclose a cheque/postal order payable to ***KAYDE Electronic Systems Ltd***, for £............ *Please charge to my Access/Barclaycard/Trustcard account no.

*Please delete/complete as applicable.

Signature ________________

Name: Mr/Mrs/Miss ________________

Address ________________



When one World beater meets another.

You're bound to recognise at least one of the beautiful products above.

Miss Dominican Republic was chosen to supremely reign as Miss World 1983. Certainly, a World beater in her own right.

Then there's the QX-10. A fully integrated Desktop Microcomputer System. A new member of the world beating Epson family.

But there's more to the functional yet stylish lines of the QX-10 (just to prove that beauty isn't only skin deep). The lightweight CPU, monitor and Keyboard units are very easy to use – even for a first time operator.

You could say that our system takes all the hard work out of using software, and once used...you probably will. What's more, when it comes to cost you'll find there's more power for your money.

Just look at these qualities.

192k upgradable to 256k RAM, Z80A CPU. RS-232C and parallel interfaces. CP/M and multifont BASIC come as standard.

The QX-10 offers an incredible graphics capability. The 80 column x 25 line display has 640 x 400 resolution and full bit image control for greater definition, 16 : 1 zoom and special effects. Not to mention a unique split screen facility enabling different typestyles and graphics to be shown together. A major first for educational applications.

For even more power – simply slot in up to 5 optional interface cards for cassette, bar code reader, joysticks, sound generator, plus a universal interface card for developing your own interfaces. Clock calendar and full battery back-up complete the system.

As with all the other respected Epson products, you are assured of high quality. (We even manufacture the slim line disc drives ourselves.)

So, at last there's a desktop microcomputer system that really works together. To really work for you.

We call it compatibility. You will call it the incredible QX-10.

QX-10

THE HUMAN COMPATIBLE BUSINESS MICRO

EPSON

Extraordinary product.
Exceptional quality.

Epson (UK) Limited, Freepost, Wembley, Middlesex HA9 6BR.
Freefone: 2730. Telex: 8814169.

☐ I would like a demonstration of the QX-10.
☐ Please send me details and the name of my local stockist.

Name ______________________

Position ______________________

Company ______________________

Address ______________________

____

______________________ Tel: ______________________

YC5

NOW . . . FOR ZX SPECTRUM USERS EVERYWHERE

THE FULLER BOX . . .



A NEW DIMENSION IN SPECTRUM CAPABILITY

It's easy to see why the ZX Spectrum is outselling all the other small colour computers, it really is a marvel of new technology. Equally marvellous is the new 'Fuller Box' for your Spectrum. Sound Quality is improved enormously with the built in *Audio Amplifier* which works with all Spectrum programs. *The Sound Synthesiser* will make any sound you want to design: explosions, laser blasts, trains, birds etc. It's based on the popular G1-AY-3-8912 chip, and is supplied with a demo program. Finally, the *Joystick Port* enables you to use any low-priced Atari/Commodore joysticks with your programs. The Fuller Box fits neatly on to the back of your ZX Spectrum,and does not interfere with any peripherals, including the new Spectrum microdrives.

PRICE (INC. VAT) **£29.95 + 80p p&p**

But the story doesn't end there! The Fuller Box has been designed to perform many other functions, and extra, expanded versions are already available.

The Fuller Orator An amazing Speech Synthesiser which can be programmed to say anything you command, using the keyboard or demo cassette. It uses the GI SP0256 AL voice synthesiser chip; and comes complete with the Fuller Box.

£39.95 + 80p p&p (inc. VAT)

Fuller Sound Amplifier Box, including Audio Amplifier (non-expandable) **£6.95 + 80p p&p** (inc. VAT)

Fuller Orator upgrade kit – to fit inside Fuller Box **£24.95** (inc. VAT) (postage free, does not include Fuller box)

Fuller 'Master Unit'– including Orator, synthesiser, amplifier and Joystick port in Fuller Box

£54.95 + 80p p&p (inc. VAT)

Fuller FD42 System NOW FOR ZX81 or ZX SPECTRUM



This famous, best selling product immediately converts your ZX Computer into a sturdy, attractive and professional unit, with full size typewriter keyboard. A tough plastic case encloses the keyboard, P.C.B. and power supply. It has 42 keys including all the ZX81/Spectrum graphic characters printed on them. The full travel key switches have gold plated contacts and guaranteed life of 10^6 operations. IT'S SO EASY TO INSTALL! You simply unscrew the ZX PCB from its case, screw it to the FD case, and plug in the keyboard. No soldering or technical knowledge required.

NOW ALL ONE PRICE! £29.95 (inc. VAT) + £2.50 p&p

16K Spectrum Expansion Module – to fit into back of Fuller case – **£24.95** (inc. VAT & p&p).

RAM Adaptor Board – enables you to fit 16K Expansion inside Fuller case – **£9.75** (inc. VAT & p&p).

Fuller FDS Keyboard for the ZX81 or ZX Spectrum

Our new advanced keyboard has the same, fine specifications as the FD42 system, but with a new, re-designed case, space bar and double-sized shift and enter keys. A must for the discerning ZX81 or Spectrum user.

SPECIAL LOW PRICE £39.95 (inc. VAT) + £2.50 p&p.

Fuller ZX Spectrum Upgrade Pack

16K Spectrum owners – upgrade to 48K with a Fuller Spectrum Upgrade Pack – Complete with full assembly instructions. Model 2 or 3 only. **£34.95** (inc.VAT) **p&p FREE!**

COMPUTER DEALERS!

Contact us for a Special Fuller Introductory Pack. We are looking for dealers throughout the U.K.!

Fuller MICRO SYSTEMS

Mail to: **FULLER MICRO SYSTEMS,**
The ZX Centre, Sweeting Street, Liverpool 2.
Telephone: 051-236 6109

Please supply the following items:

ITEM	QUANTITY	PRICE	POSTAGE	TOTAL

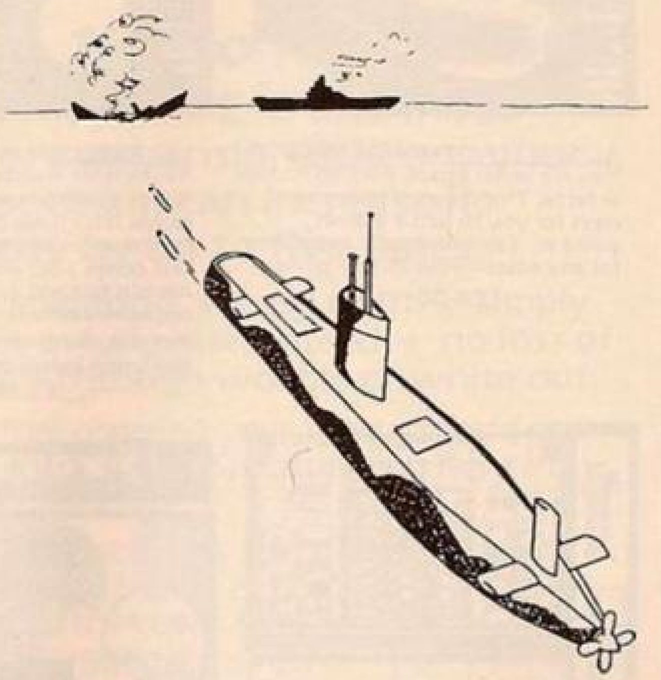
I enclose cheque/p.o. ☐
Or, please debit my Access/Barclaycard No.__________
Name__________
Address__________

Please send me further details, I enclose S.A.E. ☐

YCS 83

PROGRAM DIRECT

DRAGON SOFTWARE



SUBMARINE COMMAND

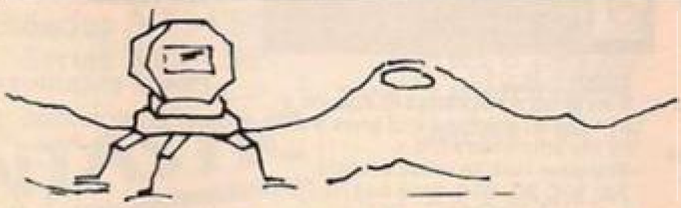
Take a modern Nuclear Submarine on anti-shipping patrol across the Atlantic. Stalk the enemy's convoys and sink his ship – but beware – enemy warships will be hunting you!.

Great new game especially written for **Dragon** with full colour graphics in Machine Code. **£7.95 (inc.)**

FEATURES INCLUDE:

- Animated map and sonar screen
- View the enemy through the periscope
- Conventional and homing torpedoes
- Surface–surface missiles
- The enemy uses surface warships and aircrafts against you
- Full status report
- Full easy to understand instruction sheet.

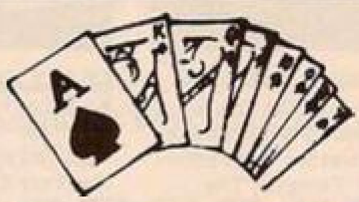
DRAGON GAMES PACK



LUNAR LANDER o BOMBER o BREAKOUT – All in one cassette.

Exciting and addictive. **£5.95 (inc.)**

MASTER CARDS PLAYER



Sophisticated implementations of two of the most popular card games **POKER** and **PONTOON**.

Each program uses high resolution colour graphics. Bluff or be bluffed. **£6.95 (inc.)**

GREAT NEW GAMES FOR YOUR DRAGON 32 COMPUTER

OUR GUARANTEE

If our product ever fails to load, simply return it within 14 days and we will immediately replace it with refund for the postage.

All prices include VAT, Postage & Packing.

Send Cheques / P.O. made payable to:

PROGRAM DIRECT LIMITED
37B NEW CAVENDISH STREET
LONDON W1M 8JR

DEALERS ENQUIRIES WELCOME

Please send me the following software immediately:

- ☐ **Submarine Command** **£7.95 inc.**
- ☐ **Master Cards Player** **£6.95 inc.**
- ☐ **Dragon Games Pack** **£5.95 inc.**

I enclose a Cheque / P.O. for £ . . . .

NAME: . . . .

ADDRESS: . . . .

. . . .

. . . . Postcode: . . . .

UNEXPANDED VIC 20

VIC 20 SOFTWARE FROM INTERCEPTOR MICRO'S

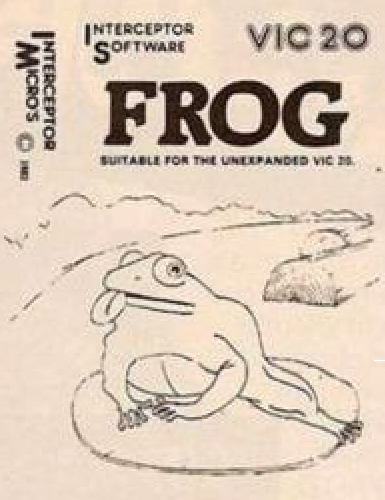
UNEXPANDED VIC 20



GALAXZIONS – MACHINE CODE
This is the most amazing alien game ever seen on the VIC 20. Galaxzions swarming in attack formation to destroy your planet. The nearest program to the real arcade game for the unexpanded VIC 20

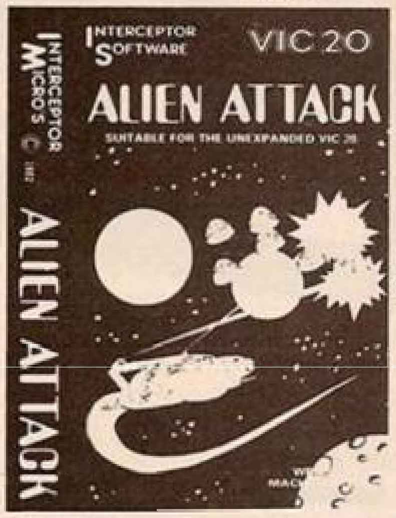
~~....£7.00~~

NOW ONLY £5.00



FROG
An amazing version of Frogger in the unexpanded VIC 20. With diving turtles and plenty of vehicles to run you down. Fast action and high resolution graphics. Joystix or Keyboard control.

....£4.00



ALIEN ATTACK – MACHINE CODE
You are under attack from an immense force. This program has various ways for you to battle against, giving an extra-terrestrial experience for any adventurous human being

....£6.00



VIC RESCUE – MACHINE CODE
Your planet is under attack by a fourth dimension and your only escape is by lunar pod to the mother ship. However you must first dodge your way through the Astroid belt and onto the landing pad before returning home. Keyboard or Joysticks control, high resolution colour graphics

....£5.00



FANTAZIA – MACHINE CODE
Star Wars was never like this, you are being invaded by the ultimate Alien force to create a most entertaining game of Fantazia. The enemy are coming in from all angles in some of the most amazing formations. The end of civilisation is near and the only way out is in your hands. May the fear be in you!! Hi-Res colour graphics

....£6.00



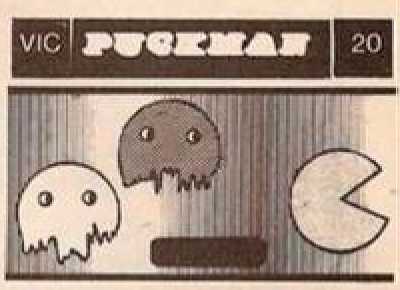
CRAZY KONG – MACHINE CODE
Kong has stolen Mario's girlfriend and taken her to the top of his steel fortress. You must guide Mario first across the 'Easy Elevator' and over the custard pies onto the fortress. Up the ladders to your loved one, however, be careful not to be killed in the process by the barrels which Kong hurls down the structure. Includes some of the best graphics ever seen on the VIC 20

....£6.00



PENNY SLOT
This program is designed around a penny slot machine and gives true to life animated action.
Try your luck to win a fortune.
For VIC 20. With hold and nudge features for only

....£4.50

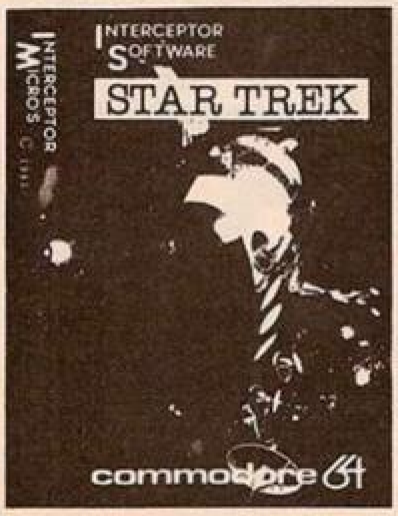


PUCKMAN – MACHINE CODE
The old favourite back again. Joysticks or Keyboard control. Fast action. High resolution colour graphics on the unexpanded VIC 20

....£6.00

TRADE ENQUIRIES WELCOME
Tel: (07356) 71145

commodore 64



STAR TREK – CBM 64 24K
Your mission is to clean up the universe from the rebels which inhabit the planets. Warp from galaxy to galaxy in an attempt to complete your aim. Uses sprite graphics and contains full documentation for the beginner. Bravely go where no man has gone before!

....£7.00

NEW !!

PANIC 64

STOP PRESS
FROGGER 64 NOW READY
M/CODE + SPRITES
ONLY £7.00

Mr, Mrs, Miss ....
Address ....

Quantity	Item	Unit Price	Total
	Frogger 64 CMB64	£7.00	
	Galaxzions Vic 20	£5.00	
	Crazy Kong Vic 20	£6.00	
	Frog Vic 20	£4.00	
	Alien Attack Vic 20	£6.00	
	Fantazia Vic 20	£6.00	
	Puckman Vic 20	£6.00	
	Panic CBM 64	£7.00	
	Star Trek CBM 64	£7.00	
	Penny Slot Vic 20	£4.50	
	Vic Rescue Vic 20	£5.00	
	Postage & Packing	.50P	50P
		TOTAL	

Send order to: Interceptor Micro's, Lindon House, The Green, Tadley, Hants

Interceptor Micro's Lindon House, The Green, Tadley, Hants.

WANTED ONE FULL TIME

MACHINE CODE PROGRAMMER 6502 or Z80

FABULOUS!

SINCLAIR ADD-ON OFFER

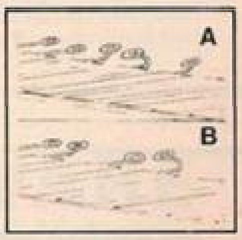
from 16k to 48k or 80k

With our ME48 and ME80 memory expansion add-ons your ZX Spectrum can increase its capacity by up to five times.

★ No soldering ★ easy to fit ★ simply plug in ★ fully guaranteed ★ no loss of memory through wobble or white out.

NB. Before ordering your Spectrum add-on please check which Spectrum you have in your possession.

At the back of the ZX Spectrum the metallic contact strips can be clearly viewed. In the series A the space separating the strips is the same width as the strips. In the series B the strips are twice as wide as the space between.



SPECTRUM

ME48 Series A £34.50 Series B £24.50

ME80 Series A £49.50 Series B £49.50

ZX81 ME16 £19.25 ME64 £44.25

FANTASTIC

TS 2000 SS1 SPEECH SYNTHESISER

SIZE 3½″ x 5¾″ x 1″

- ★ Make amazing speech effects with your ZX Spectrum.
- ★ Specially designed for use with your Spectrum. Just plugs in, no dismantling or soldering.
- ★ No power pack, leads, batteries or other extras.
- ★ Ample volume for built in loudspeaker, Manual Volume Control on panel. Can be plugged in to Existing hi-fi system.
- ★ Uses only one memory address.
- ★ Free Dictionary of Sounds.

SS1 SPEECH SYNTHESISER £39.00

NEW

TAPE LOAD ANXIETY?

Vu-Load takes the frustration out of loading your ZX81 or Spectrum programmes.

- ★ insures programme load every time
- ★ monitors tape output level
- ★ gives positive save indication
- ★ detects blank tape without disconnecting cassette wires
- ★ ready to use – no wiring

TL £19.99

*NB. Add 40p Post & Packaging to the price of all items.

NEW

LEVEL-VU PRISM

Allows you to see your tape counter without moving from your seat!

- ★ attaches easily to recorder body or lid
- ★ fits most recorders including Radio Shack, Vic-20, Atari
- ★ greatly magnifies counter numerals

LVP £3.99

Free 23 line memory test programme with every add-on.

Please tick the appropriate box to order your Computer Add-on:

Memory Expansion Spectrum ME48 Series A ☐ Series B ☐ ME80 Series A ☐ Series B ☐ ZX81 ME16 ☐ ME64 ☐ Speech Synthesiser SS1 ☐ Tape Load TL ☐ Level VU LVP ☐

I enclose a cheque or postal order for ______ made payable/crossed to Computer Add-ons, or I would like to pay by Access or Barclay Card and I enter my number and signature accordingly *Allow 28 days for delivery.

☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

*NB. Add 40p Post & Packaging to the price of all items.

Signature ______

Date ______

Name ______

Address ______

______

Occupation ______ YC2

COMPUTER ADD-ONS 7-9 Thane Works, Thane Villas London N7

COMPUTER ADD ONS

7-9 Thane Works, Thane Villas London N7

INSTANT IMAGE TRANSFER TO ZX SPECTRUM
RD DIGITAL TRACER £55.50



Please send me .... RD DIGITAL TRACERS at £55.50 each (including P&P and VAT). I enclose cheque for £ .... payable to RD Laboratories Ltd.

Name ....

Address ....

....

....

Send to: Dept. YCM, RD Laboratories Ltd., 20 Court Road Estate, Cwmbran, Gwent NP44 3AS

RD Laboratories also supply the RD 8100 SYSTEM for economic automatic measurement, test and control. The modular-based RD 8100 SYSTEM is already used widely in many applications – from scientific experimentation to small-scale energy management systems. Please send stamp and address for brochure.

The high resolution colour graphics of the ZX Spectrum permit accurate presentation of complex or irregular images – maps, technical drawings, even personalities. But entering individual co-ordinates for unusual shapes can be tedious and time-consuming.

The RD DIGITAL TRACER cuts out tedious plotting. It provides instant transfer from original to diplay file – for screen display, ZX printer printout, or retention on cassette.

The RD DIGITAL TRACER is supplied with tracing sheet, software cassette and full instructions on use. Latest software includes fast colour fill, audible keystroke acknowledgement, fast PAPER colour change and fast LOAD from saved display file.

This is an invaluable tool for engineers, architects and other technicians, and for educational use in the presentation of lectures, and in computer training and application. Designed for the ZX Spectrum, the RD DIGITAL TRACER as supplied is compatible with ZX 81, although high resolution colour graphics are not available on this machine.

The RD DIGITAL TRACER is available from computer shops or direct from RD Laboratories. The direct (UK only) price of £55.50 includes Postage, Packing and full V.A.T. Send a cheque (payable to RD Laboratories Ltd.) with order for delivery within 28 days, or ask your local dealer for details.

R D Laboratories Ltd

20 Court Road Estate Cwmbran Gwent NP44 3AS
(06333) 74333

ORIC SOFTWARE

Dept. YC(1) 118 Worcester Rd, Malvern, Worcs., WR14 1SS

SPECIALIST SUPPLIERS OF ORIC SOFTWARE

BIORHYTHMS 48K	5.95
SYNTHESIZER 48K	7.95
ZODIAC ADVENTURE 48K	9.95
CHESS 48K	9.95
ORIC BASE — Data base 48K	9.95
MULTI GAMES 48K	7.95
ORIC LANDER 48K	7.95
FORTH 48K	17.50

Postage & packing 50p (1 to 7 cassettes)

ORIC CASSETTE LEADS: — 7 PIN DIN — 3 JACKS		2.25
48K ORIC	NOW IN STOCK	169.95
	Postage and packing	5.95
CGP-115	4 COLOUR GRAPHIC PRINTER	149.00
	Cable for Oric Computer	22.95
	Postage & packing	5.95

Return to:
ORIC SOFTWARE, Dept YC(1), 118 Worcester Rd, Malvern, Worcs., WR14 1SS. Tele. Malvern (06845) 62467

I have a 16K Oric ☐
48K Oric ☐
My software interests are:—
Home ☐ Business ☐
Games ☐ Education ☐
Other (Please specify) ....

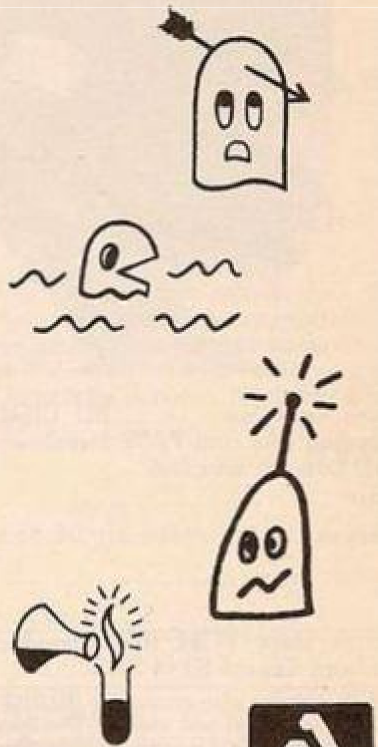
Mr/Mrs/Miss/Ms ....
Address ....
Postcode ....
Cheque enclosed ....
Please debit my Access/Visa
AMex/Dclub — With £ ....
No. ....

SOFTWAREE WRITERS:— Lump sum or royalty payments. Send tapes & details.
(Tapes not returned unless postage is included).

ZX Workstations.. for Spectrum&ZX81



These stylish plinths, in tough moulded ABS, will raise and tilt the TV for better viewing, and angle the computer for easier typing. The power supply is fixed underneath. The printer can be used with the Spectrum version, the RAM with the '81', and the cassette player with both. Full details from: Peter Furlong Products, Unit 5c, South Coast Rd Ind. Estate, Peacehaven, Sussex BN9 8NA. Tel (07914) 81637





FOX ELECTRONICS

Presents Products:

NEW!

For the Spectrum, The VIC-20, The Jupiter Ace and the ZX-81

The Fox **Spectrum Upgrade** Kit (for issue 2 machines only) takes your machine to 48K, no soldering required and full instructions supplied.
Unbeatable value at £24.00

Improve your games with the Spectrum **Joystick.** Professionally built from strong nylon and steel. A must for all games lovers. ONLY

£25.00
+ £1.00 P&P.

New Sounds for your Spectrum with the *New* programmable sound generator.

£19.95
+ 50p P&P.

or inexpensively enhance existing sounds with a sound expansion for only £6.95 + 50p P&P.

Or let your Spectrum do the talking with the **Chatterbox** phonetic synthesis, unlimited vocabulary complete with speaker/-amplifier and housed in a smart black box. Also for **ZX81. Both at**

£56.00
incl. P&P.

New from FOX the **Vixen RAM Cartridge** for the VIC 20. Switchable between 16K or 8K + 3K gives you the option of full 16K RAM or 8K and 3K RAM in one pack. Simply plugs into rear expansion port no re-addressing of existing basic programs needed only



£39.95 *incl. P&P.*

Let your VIC 20 talk to you with the **New Chatterbox** speech synthesizer with an infinite vocabulary of spoken words. Fully programmable and simply plugs into VIC or Motherboard. Includes a series of software routine in Eprom to facilitate the programming. **£57.00** *incl. P&P.*

Coming shortly from FOX

THE TANDEM
Expandable expansion system, gives 4 expansion slots for VIC 20 cartridges. Custom designed case, plugs directly into computer. Further expanded by using Tandem system ROM socket. No extra power supply needed. **£33.00**

THE PACER
Uniquely expandable 16K RAM pack for the **Jupiter Ace.** Similar concept to ZX Panda. For more power to **Faster Forth** you **need** a **Pacer.**
16K expandable RAM £29.95
16K Module £19.95 incl.

Improve your Memory with the ZX Panda. The **uniquely** expandable 16K RAM pack. Simply expanded to 32K by insertion of a plug in module. Specially designed to eliminate wobble, and complete with LED power indication



16K expandable RAM pack	£19.95 *incl. P&P.*
16K expansion module	£14.50 *incl. P&P.*
or 32K complete for	£34.45 *incl. P&P.*

or go for the **Big Big** pack 64K only £50.00

ZX81 Keyboard (identical to Spectrum keyboard opposite again with ZX81 PCB fitting inside, again without soldering. A great buy at only **£29.95** *+ £2.50 P&P.*

ZX81 Keyboard No 2.
Alternatively, go for the stylish and efficient, pushbutton, precision moulded (ABS as per your ZX81) 3 coloured keyboard at an incredibly low price of Unit adheres direct to ZX keyboard. No soldering required. **£10.00** *incl. P&P.*

Coming Shortly
The Spectrum Echo. Volume and tone control. Load and Save without switching leads. Looks good, sounds good.
£23.50 *incl. P&P.*

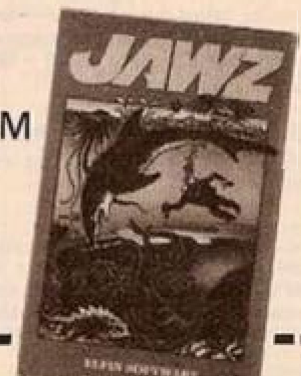
Send now to FOX Electronics 141 Abbey Road, Popley 4. Basingstoke, Hants Catalogue available. Send SAE. All products guaranteed 1 yr. Overseas customers add a further £1.50 P&P to all items. Delivery 10-14 days.

Mind Bending or just good fun?

TOBOR
48K SPECTRUM
You are relentlessly pursued by Robots as you move through their city.
£7.95



JAWZ
16/48K SPECTRUM
Don scuba diving gear to shoot the killers of the deep.
£4.95



ROAD TOAD
16/48K SPECTRUM
You hop your Toad across the road.
£4.95



Elfin have created 3 new games for family enjoyment. There's TOBOR a test of skill and strategy, ROAD TOAD a test of reflex actions as you hop around the hazards and JAWZ to test your ability to fire at moving objects. All games are machine code to give fast arcade action and lively colourful graphics on your screen.

If you can't find them in your favourite store just fill in the coupon and post it to us with your remittance or phone your card number to us and we will see you have them by return post.

Trade enquiries. All games for 1 or 2 players.

Buy any 2 tapes and get the third for £1.25

ELFIN SOFTWARE More than fun and games.

Please send me:

Quantity ____ TOBOR £7.95
Quantity ____ JAWZ £4.95
Quantity ____ ROAD TOAD £4.95

or use my credit card Access ____ Barclaycard

Card No. ____

Name

Address

To Elfin Software. Hudsons House, Battery Rd. Gt. Yarmouth NR30 3NN – Phone 0493-53170

Add 25p for postage & packing

AWESOME GAMES SOFTWARE FROM * LLAMASOFT *

NEW FROM THE DESIGNER OF GRIDRUNNER

SO GOOD IT WILL BLOW YOUR MIND!!

SO FAST IT WILL BLOW YOU AWAY!!

The BIGGEST ADVANCE in Video Games design since Defender hit the Arcades!

Experience Laser Zone-an utterly NEW, TOTALLY ORIGINAL MASTER-PIECE of Video Games Design!!

Learn to control two spaceships at once. FEEL THE EXHILARATION as, after long hours of practise, you control the two ships so that they function as a SMOOTH, CO-OPERATIVE TEAM!!

LASER ZONE. Quite simply the BEST VIC-20 Game in existence!!

LASER ZONE

Feel the RAW POWER as you lunge for the Electro Button and BLAST your enemies into expanding clouds of SPACE JUNK!!

Laser Zone requires a Joystick, 8 or 16k, and DEDICATION!!

FEEL THE HUMILIATION as a carelessly -aimed BLAST SLAMS into the side of your last remaining ship!!

Designed and Programmed by Jeff Minter for the VIC-20 with 8 or 16k Ram Pack. If you don't yet have the memory, LASER ZONE IS THE ONLY EXCUSE YOU NEED TO BUY IT!

£6.00

A COMMODORE 64 version will be available soon.

* LLAMASOFT * NOT JUST A PRETTY PACKET

J = JOYSTICK CONTROL
K = KEYBOARD

VIC 20

LASERZONE (8K+) NEW J
Destroy the oncoming ALIENS with your TWO independently controlled laser bases! Lunge for the ELECTRO button and blast your enemies into expanding clouds of SPACE JUNK! An exhilarating and totally original game with a unique system of control from a standard joystick. A mere **£6.00 + 50p P&P.**

ABDUCTOR J
A classic new space game! ZAP the swirling alien hordes before they ram you — and abduct your humanoids! Survive the assault for long enough and you'll get an extra stage on your spaceship with double firepower! Awesome unexpanded Vic Action. **£6.00 + 50p P&P.**

GRIDRUNNER J
Finally, true arcade quality on the unexpanded VIC! Shoot down the segmented DROIDS invading the grid. Beware of the pods and zappers! The awsome speed, sound and graphics gives you the best blast available for unexpanded Vic. **£6.00 + 50p P&P.**

ANDES ATTACK (8K) J
Your spacecraft must attack the descending aliens and frustrate their evil intent. Fly your Ramjet fighter over the Andes mountain range and protect your llamas from kidnap by hostile UFOS. Features 5 kinds of UFO, controls include up, down, reverse, fire, thrust and smart bomb. Entirely in machine code. Requires 8K expansion and joystick. **£8.00 + 50p P&P.**

TRAXX M/C (8K + EXPANSION) J
This is VIC 20 cross breed between the now famed 'Packman' and the game 'Quix'. All in machine code, fast and fun with joystick controls, uses Hi-Res colour graphics. 8K or larger expansion needed. **Only £6.00 + 50p P&P complete with instructions.**

THE VERY FIRST COMMODORE 64 GAMES

ATTACK OF THE MUTANT CAMELS J
Planet earth needs you! Hostile aliens have used genetic engineering to mutate camels from normally harmless beasts into 90 foot high, neutronium shielded, laser-spitting death camels!! Can you fly your tiny, manoeuvrable fighter over the mountainous landscape to weaken and destroy the camels before they invade the human stronghold! You must withstand withering laser fire and alien UFOs. Game action stretches over 10 screen lengths and features superb scrolling, scanner, 1/2 player actions and unbelievable animation! Play this game and you'll never be able to visit a zoo again without getting an itchy trigger finger! Awesome m/c action! **£8.50 + 50p P&P.**

ROX-64 K
Rox is a challenging game involving the defence of your lunar base from a deadly meteor shower. Rox-64 includes amazing sprite graphics displays and spacy sound effects, and an awesome 'mothership' display if you win the game. Top 10 scores are tabled along with their names. This program shows just what can be achieved using only Commodore-64 basic. Study the listing and learn how to use sprites and sound on this outstanding machine. **£4.95 + 50p P&P.**

GRIDRUNNER 64 J
The No. 1 best game for the Vic has been improved for your COMMODORE 64! Gridrunner is a smash hit in the USA. Now experience the lightning-fast challenge of the grid on the 64. Features 31 skill levels and excellent sound and graphics. Sore trigger finger *free* with every game! **£8.50 + 50p P&P.**

SPECTRUM

GRAPHICS CREATOR (16K)
Not just another character editor! Allows you to define not only the 21 user definable characters. Also allows you to change the entire 96 character ASCII set. Creates BYTES files ready for you to load into your own programs. Includes advanced Reflect, Invert, Field commands etc. Complete with full documentation. Bin the BIN statement and use Graphics Creator with its easy on-screen cursor editing. **£2.95 + 50p P&P.**

BOMBER (16K) K
Yes, a full feature version of the popular game 'Blitz', supplied for the 16K or 48K Spectrum. **For only £2.95 + 50p P&P.**

HEADBANGER (48K) NEW K
Colourful new game starring Chico the headbanger who you must guide to riches through an increasing shower of heavy metal. Gain bonuses for headbanging but be sure to take an aspirin when the pain gets too much! Basic + m/c to speed up action. Great graphics, nice animation. Will even drive William Stuart system's voice synthesiser to produce speech output. Can you attain the grade of 'Rocker Class One' or will you be "Barry Manilow'Class 5"? Start headbanging to-day and find out. **£4.95.**

SUPERDEFLEX (48K) NEW K
Bounce 'Sid', the space invader, around the screen into the power pods, keeping away of course from the devil who chases you around the screen. Steer with your Deflex shields, but beware the mines or you may be buried alive! Superb graphics and fantastic sound on the 48K Spectrum only. **Only £4.95 on cassette + 50p P&P.**

ATARI 400-800

GRIDRUNNER NEW J
Now play the best selling VIC/C64 game on your ATARI 400/800. Any memory size (16-48K). Basic cartridge *not* required — 100% machine code autoboot tape. Play this awesomely fast and addictive game on your Atari. **For only £8.50.**

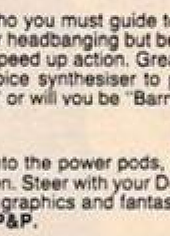
TURBOFLEX K
Superb ultra-fast and totally new ball game. Uses ATARI's unique features to the full. Incorporates superb colour/sound effects and uses Player/Missile graphics. Tables top 10 scores along with Scorer's name. **£6.00 + 50p P&P.**

ZX81

CENTIPEDE (16K)
the ORIGINAL game from the ORIGINAL author. This is the identical program to that being sold by other companies for three times our price. The game has received ecstatic reviews in the computing press. Program has 30 speed levels and ever increasing Centipede hordes. Tables top 10 scores and names. Why wait to pay more? **Only £1.95 + 50p P&P.**

Please add 50p P&P with all orders

LLAMASOFT SOFTWARE



Dept. YC
49 Mount Pleasant,
Tadley, Hants
RG26 6BN.
Tel: 07356-4478
Trade enquiries welcome.

YOUR COMPUTER CLASSIFIED 01-661 3036

Britain's Biggest Selling Home Computer Magazine

UPGRADE YOUR 16K ZX SPECTRUM TO 48K

SIMPLY FITS INTERNALLY WITH NO SOLDERING. WILL FIT ALL THREE VERSIONS OF SERIES 2 MODELS. UNLIKE COMPETITORS, WE USE ADAPTOR P.C. BOARD TO ACHIEVE RESULTS. DESIGNED BY EX SINCLAIR ENGINEER. MODEL CP48 £23.95 inc. P&P (EXPORT & UK) OR FITTED BY OUR ENGINEERS (don't send power supply) £31.50 inc. P&P.

32K MEMORY EXTENSION ONLY £23·95

CITADEL PRODUCTS LIMITED (YC) TEL: 01-951 1848
DEPT YC 50 HIGH STREET, EDGWARE, MIDDLESEX HA8 7EP.

JUPITER ACE USERS CLUB

Newsletter, software (both games and utilities), adapter for ZX81 add-ons.
SAE for details.
Remsoft, 18 George Street, Brighton BN2 1RH 37/3

Software Library for the Oric. Two weeks hire, £1.00. Additions each month. £5.00 annual membership. Send stamp for free list. Les Wilson, Penallick Treknow, Tintagel, Cornwall PL34 0EJ Box No. 83/3. 97/4

Spectrum Graph Plotter. Draw your own Pie-charts, Bar-charts, Line plots and scatter diagrams with this very versatile package of five routines. £5 for tape (includes five tutorials/demonstrations) and full documentation or SAE for details. Topgraph Software, 106 Blundell Road, Luton, Bedfordshire.
75/4

COMMODORE 64 — Vic 20 — Atari 400/800 — CGL Home Computer — the best chess computers — all obtainable at the lowest prices by mail order from:

DOSKA CHESS SUPPLIES
(Registered Commodore Dealer)
Poulton-le-Fylde, nr. Blackpool, Lancs. Phone: 0253-899742
(evenings and weekends included)
14/3

Jupiter Ace tape 5K upwards, guaranteed, unbelevable games: Asteriods, Ski-Run, Pakman, Invaders, Frogger, Luna Lander £6. AMR-Soft, 9 Westminster Terrace, Chester.
91/4

BBC Primary Education Software
A series of programs for the BBC "B" machine, covering a range of language and maths skills. From £5.95
BBC Graphics Printer Packs
Complete package, the latest EPSON RX80 or FX80 printer, BBC cable, Software, and even a 13A plug. From £295.00 complete.
BBC Games and Utilities

Gamespack 1	£5.95
Utilitypack 1	£5.95

Send SAE for details to;
22 Mercer Close, Basingstoke, Hants.

Spectrum Adventure, Fills 48K. Textual game with comprehensive commands/replys. Good plot, save game routine. £4.00 to D. Slater, 11 Taney Crescent, Dundrum, Dublin 14, Ireland.
72/4

No more eyestrain with your ZX81. Video inverter displays sharp white characters on solid black background TV screen. A toggle switch lets you choose between normal and reverse. The small PCB fits on top of the logic chip inside your ZX81. Kit £4, Built £5, includes easy to follow instructions, VAT/P&P. Send cheque/PO to: D. Fritsch, 6 Stanton Road, Thelwall, Warrington, Cheshire, WA4 2HS. Box No. 1
9/2

ORIC I
CASSETTE LEADS
Din to Din & remote jack plug
Din to 2 × 3.5mm jacks
1 × 2.5mm for remote
PRICE ONLY £2.50
Cash with orders includes p&p
CLARES
222 Townfields Rd, Winsford, Cheshire CW7 4AX. Tel: Winsford 51374.
58/2

Acorn Atom 12+12K, Floating Point Toolkit Books, Business, Machine Code, Pools Predictor, 16 games including Chess, 747. Tel: Keighley (0535) 606364.
62/4

PROM SERVICES
Permanent software for ZX micros

ZX81	
8K EPROM board + EPROM 1 or 2	£20
EPROM 1 40 toolkit routines	£10
EPROM 2 rapid SAVE/LOAD	£10
*EPROM 4 20 routine M/C monitor	£10
EPROM 5 Z80 disassembler	£10
Expansion Board — 3 slot	£15
Graphics Board — inc. 4K EPROM	£24.50
SPECTRUM	
EPROM BOARD	£19
16K RAMPACK adaptor	£6.50
32 line I/O board (also fits ZX81)	£16
Edge connector 23 or 28 way	£2.50
Edge cord 23 or 28 way	75p
*Tape version — special price	£5

Many other ZX products. SAE for list.
EPROM SERVICES
3 Wedgewood Drive, Leeds LS8 1EF (0532) 667183 19/3

Spectrum. Pre-school, early school cassette, 7 educational and stimulating programs for children aged 3-10 years. Suitable schools or home. Written by teachers. All for £5. Cheque/P.O. to Essex Software, 16 Huntsmans Drive, Upminster, Essex.
105/4

Sharp MZ-80A, New January, hardly used, Software includes Games, Home Finance, Education, Basic Tutorial, Applications, £350 only for quick sale. Telephone Southrop 361 Evenings, (Glos/Oxon border).
102/4

BBC PRIMARY EDUCATION SOFTWARE
A series of programmes for the BBC *Model B machine covering a range of* language & maths skills.
PRICE £5.95 each.
BBC GAMES & UTILITIES
GAMES PACK 1.
for BBC Model B featuring TRON, LIFE & CUBIC.
PRICE £5.95 each.
UTILITY PACK 1 for BBC Model B
PRICE £5.95 each.
EPSON PRINTER PACKS FOR BBC MODEL B
A complete package, the latest EPSON printer, BBC graphics software, connecting lead & even 13 amp plug.
EPSON RX-80 £320 inc VAT.
EPSON FX-80 £450 inc VAT.
Send order or SAE for details to:
PROCESSOR APPLICATIONS
22 Mercer Close, Basingstoke, Hampshire 130/4

Jupiter Ace Software. Send SAE for leaflet. Peak, 25 Plymouth Road, Springfield, Chelmsford, Essex CM1 5JG.
69/4

WANT TO USE YOUR SINCLAIR?
We really mean USE your ZX81/SPECTRUM PRO-GAMES offer the best in games, education, business programs and books to suit everyone. Hire a tape/-book for two weeks (approx £1.40) then if you want it pay the difference if not return it and try again. This unique service is available for £10 a year. Send cheque/PO for membership card, catalogue, news, reviews, special offers.
PRO-GAMES, 10 LEYBURN GROVE CHAPELTOWN, SHEFFIELD S30 4ES
122/4

Enhance your ZX81 Programs. M/C screen inverse/screen clear. SAE +80p. Richard Hagedorn, 17 Palace Gardens, Buckhurst Hill, Essex IG9 5PQ.
64/4

16K SPECTRUM UPGRADE
Upgrade your 16K Spectrum (issue1) to 48K. I.C. kit with full inst. £23.00 inc. P.P. — or send us your 16K issue 2 Spectrum for upgrading — £27.00 inc. P.P.
SPECIAL OFFER TO ZX CLUBS — We will upgrade a minimum of 5 Issue Spectrums for £24.50 ea., returned to one address. Mail order, by return.
J.C. BREWER (Dept YC), 7 Roseberry TCE., KIRKCALDY KY1 1DW
125/4

Atari 400/800 owners. Hire from our comprehensive range of cartridges, cassettes, discs, SAE for details. Castel Games Library, 44 Augusta Close, Rochdale, Lancs. Phone (0706) 59602.
95/4

Davic Games
for the 16 or 48k Spectrum
Tape No. 1. 5 Programs, good clean graphics. NO BUGS.
SERPENT CANDYMAN DEFENCE DESIGNER E.S.P. TESTER
Only £4 inc. P. & P. Cheques, P.O's payable to:— D.E. SMART
42 Gossamoor Lane, Erdington, Birmingham, B23 5PN.
113/4

Exchange your unwanted software. Free membership to our exchange club, send SAE for details. A & P Services, 142 Broadstone Way, Bradford, Yorkshire.
96/4

E.S.P. ESTUARY SOFTWARE PRODUCTS
A NEW NAME IN THE Apple AND SINCLAIR SOFTWARE
HITCH-HIKERS GUIDE TO THE GALAXY
FOR 48K SPECTRUM **£8.95** Also available for Apple II plus. Please allow 14 days delivery
Tel: (0702) 43568
261 VICTORIA AVE, SOUTHEND ON SEA ESSEX
CREDITCARD HOLDERS MAY PHONE IN THEIR ORDERS
VISA
132/4

Bank Raid. Challenging new game for ZX81 16K. Only £4.00 on high quality cassette. PJM Enterpries, 28 Hartwood Road, Southport, Merseyside. Cheques to PJ Morris.
65/4

ANVIL COMPUTING
SUPERB NEW SELF TEACH PROGRAM
For ZX81 (16K) and Spectrum

- Now you can learn Basic fast and efficiently •
- Forget your past programming problems •
- •• This program will make it all clear ••

Includes Arrays, Sorting, Searching, Counting, Decision making tests, Error Trapping, Menu drawing etc.

You start with short simple programs and build up to full working programs with everything explained in full precise detail.

This is NOT a program you simply copy and run
!!!! YOU HAVE GOT TO WORK !!!!
But it is written in such a way that you cannot get stuck.

This program has been fully tested over the past six months by 50 domestic and small business users and we have not received any adverse reports.

This program is our own product and is not available from any other source.

£4.75 incl. Postage & Package (Overseas £6.25).
Dept YC1, 51 Whitcliffe Lane, Ripon, Yorks. HG4 2LB 103/4

BBC MX80FT3 screen dump utility four picture sizes including sideways £7.00. MZ80K Armoured Invasion Game with nine skill levels £7.00. MZ80K Morse Tudor Sets Tests £7.00. Slavedrive Software, 19 Newlay Lane, Bramley, Leeds 13. 0532 560687.
63/4

ZX80/81 23 way female connectors £2.20 each. ZX80/81 Ramlock kits (the cure for bad RAM pack connection) £7.50 each. Add 50p per order (P&P) or send SAE for details. Adapt Electronics, Dept YC, 20 Starling Close, Buckhurst Hill, Essex.
111/4

TRANSFORM YOU PROGRAM INTO PROFITS!
We urgently require for Marketing & Publication all software suitable for Sinclair 16K-48K & Dragon 32.
Excellent Commission paid for quality material. Please send your listings or cassettes & full programme details to:
DEMON'S SOFTWARE
5 Hoskings Row, Redruth, Cornwall.
79/4

SPECTRUM CHESS

Dare you face The Turk

The original Turk was an eighteenth century automation, a life-size mechanical figure resplendent in Turkish costume and seated behind a wooden cabinet on which a chess board and pieces were placed.

OCP now offer you the twentieth century equivalent of that Turk — a chess-playing computer program. **The Turk challenges you to a game of chess!**



MANY OPTIONS INCLUDE:

- 6 Levels of Difficulty
- Demonstration Mode
- Board Editor
- Games Printout Facility
- Blitz Chess Against the Clock
- Two Player Mode
- Unfinished Games can be Stored
- Recommended Move

FULL INSTRUCTIONS PROVIDED

CHESS THE TURK ONLY £8.95

Post order to **Oxford Computer Publishing, P.O. Box 99, Oxford.**

134/4

Chess Partner 2000 chess computer with sensory board. 8 levels of play. Used twice only. £50 no offers. Goss, 93 Stephens Firs, Mortimer, Reading RG7 3XA.

74/4

KWERTY SOFTWARE

Programs available for Colour Genie, ZX Spectrum & Vic-20 including:— Backgammon (5 Levels) £5.50 ZX Spectrum only.
Games tape 1 — Aliens, Airraid & Gobble Garden. £4.95.
Games tape 2 — Lunar Rescue/-Grabit, Tank Race & Hangman. £4.95. Send S.A.E. for further details.
Cheques/Postal Orders to:
KWERTY SOFTWARE
49 St. Andrews Way,
Church Aston, Newport,
Shropshire

76/4

Z80 Opcode wallchart 29"×35", over 550 H/D/BIN mnemonics, blockform for instant M/Code, Felix Computers, 48 Thorold Street, Boston, Lincs. Tel: Boston (0205) 65400.

110/4

COUNTDOWN

Educational game for ZX81 16K. Up to 660 questions. Choose from 9 possible answers during visible countdown. Score depends on speed of response. Preset subjects, meanings of words, countries/cities, music terms, British monarchs, or set your own by responding to prompts. Select questions from an combination of subjects. Cassette £3.50. S.A.E. for more details. **Dr. G. K. Pickup, 47 Ellesmere, Burnmoor, Houghton-Le-Spring, Tyne & Wear, DH4 6EA.**

80/4

OCP

PROGRAM WRITERS READ THIS

OCP is a fast growing and highly successful software house specialising in top quality machine coded Programs for the ZX Spectrum.

We are now looking to expand our catalogue of Programs to take full advantage of the exploding home computer market. Perhaps you can help us and we can help you?

We offer a variety of Payment terms depending on your individual circumstances; this can be as a royalty Per Program sold, straight Purchase or some combination of the two. In any case you get full advantage of our Pack design and marketing expertise which we are rather proud of.

So, if you think that you have skills and Programs that set you apart from the ordinary and want to share our proven success contact us now at the adress below. If you're good you won't regret it.

Ring Bill Richardson on 0753 888866

or write to:

OXFORD COMPUTER PUBLISHING LET.
P.O. BOX 99, OXFORD, ENGLAND.

VIRGO COMPUTERS

Introductory offer of software for the
- Spectrum (16/48K)
- Dragon
- TRS80

Games include the following
- 3D Tunnel
- Escape
- Bedlam

Do not miss out on this offer, send SAE for complete list:
30 Blackhorse Lane,
Downend, Bristol BS16 6TZ

81/4

NEWBRAIN DRAGON GENIE

EDITOR adds extra commands to the machine CHANGE, FIND, GET, INSERT, DELETE, MOVE, VALUE, ORGANISE, CENTRE & RIGHT JUSTIFY TEXT. Can be used as a word processor database or program editor, handling up to 24k on a 32k machine. The files created are in ASCII format **£15**
Also available for DRAGON32 & GENIE
RENUMBER can be used independently or in conjunction with EDITOR. All or part of a program may be renumbered with update of GOTO/GOSUB/THEN/RESUME statements **£6**
MONITOR Produces machine code programs on tape. Input, display, record & test code hard copy feature. Input/-output is in HEX or ASC codes **£15**

Microplot
19 The Earls Croft, Cheylesmore,
Coventry CV3 5ES
Tel: 0203-503038

127/4

PC1251 Startrek! Realtime, 11 Levels. Fascinating! Microcassette, £5.90. J. Randle, 123 Wisden Road, Stevenage, Herts.

73/4

for sinclair ZX81

ALIEN INVADERS £5.00 inc. vat & postage

Zap the alien hordes. Bombs, motherships, missiles, bases, it's all here! Up to 48 invaders on-screen; 1 or 2 player option; high-score, Preset or Manual game with 36 levels of play; machine code, full 16k action.

Graphics Board £17.50 inc. vat & postage

Allows you to create 4 alternate sets of 64 chrs. and their inverse. Simply fits inside ZX81's case. Variable address location. Supplied complete with detailed manual & applications cassette (sae details).

REALTIME SOFTWARE 8 Park St. Long Eaton Nottingham NG10 4NA

84/4

16K ZX81 'Alien Arithmetic'. Improve your addition yet still have fun! Plus ZX81 Cesil. On cassette for £4.50 from T. Skinner, 1 Summer Drive, Hoveton, Norfolk.

70/4

TINY PASCAL PLUS for PET (16k+, all ROMS, disk or cassette) and APPLE (disk). Package consists of line editor, compiler, p-code interpreter, 50 page manual & sample programs **£24.95**
VIGIL interactive games language for PET or VIC (6.5K+). Includes 9 games & 50/70 page manual **£19.95**
SAE for full software catalogue to:
ADAMSOFT (Dept. YC)
18 Norwich Avenue, Rochdale,
Lancs OL11 5JZ

100/4

ORIC 1 12K Backgammon, 10K Orthello, 10K Startrek, 12K Battleship Patrol, 8K 3D Naughts and Crosses. Cassette £5.50 each. J. Edwards, 20 Southern Road, West End, Southampton.

93/4

SPECT-A-DRAW

NOW AVAILABLE — A 48K Spectrum version of the well known Levell II Basic Pools prediction program 'Compute-a-Draw'.
"A BOON FOR THOSE INTEREST IN WINNING THE POOLS" — Interface, December 1982.
Program on cassette with instruction manual.........................£4.95
Database tape (Optional, but contains data on over 6,000 matche.......£13.50
Program and database together...£17.50

or S.A.E. for Details.

B.S. McAlley.
1 Cowleaze, Chinnor,
Oxon. OX9 4TD.

121/4

TRS80 — VIDEO GENIE SOFTWARE LIBRARY

25 Super programmes — machine code arcade games, simulations, competitive games, Adventures, Dungeons & Dragons, puzzles and ball games; plus a few education & business programmes. Including: Breakout, Star Wars, Amazing 3D Mazes, Gambling Machine, Corridors of Doom & Trap It. All 25 on one C48 cassette, sent by return post for only £8.50 inclusive, or send an s.a.e. for full details.

SPARTAN SOFTWARE (Dept YC)
9 Cotswold Terrace, Chipping Norton,
Oxon. Tel: 0608 3069

116/4

Spy Cassette. Amazing cassette lets you stop, list or copy any previously unstoppable cassette. Includes two free Super Utilities. State if for ZX81 or Spectrum. Send just £3. Bobker, 29 Chadderton Drive, Unsworth, Bury, Lancs.

66/4

COMPUTER LEADS

Dragon Din to 3 jack. Dragon Din to Din & jack. Oric Din to Din. Oric Din to jack.

BBC Din to Din & jack. BBC Din to 3 jacks. £2.90 each. Other printer/cassette leads available. SAE for details.

ALLCOM
20 Harwood Road, Lichfield,
Staffs WS13 7PP

77/4

BIGGER ★ BETTER Buffer MICRO SHOP

ZX81 · ZX SPECTRUM ·
DRAGON 32 · VIC-20 · BBC

The very best mail order items available "over the counter"

Games, Keyboards, Serious Programs, Rams, Books, Peripherals and much, much more!

FAST MAIL ORDER SERVICE PHONE 01-769 2887
WITH ACCESS/VISA (24hr Ansafone)
or send large S.A.E. for catalogue (state which computer)

Open 10.30 — 5.30 Tues. to Sat. (closed Mondays)
310 STREATHAM HIGH ROAD, LONDON SW16

107/4

Use Atari Joystick on your Jupiter Ace. No soldering software routine and example games included. Fully tested £14. M.R. Portman, 125 Kings Road, Farncombe, Surrey.

101/4

48K SPECTRUM
Colour and Moving Graphics

O LEVEL PHYSICS

- Solids, Liquids and Gases
- Vectors and Scalars
- Acceleration
- Graphs of Motion
- Gravity, Weight and Friction
- Newton's Laws

6 PROGRAMS FOR £6.50

Cheque/PO to:
THINK TANK
Dept. YC(C), 35 Wellington Road
Wimbledon Park, London SW19 8EQ
OTHER TITLES COMING SOON

129/4

Educational Computer Programs

B.B.C. and VIC 20

Exciting educational software.
Devised by teachers. Programmed by specialist. Suitable for children aged 6-12 years.

Addigator:	7-11 years
Tables Invasion:	7-11 years
Addition Invasion:	7-11 years
Co-ordinates:	7-11 years
Builder (subtraction):	6-8 years
Castle (addition):	6-8 years

£5 each plus 50p p & p.
Send s.a.e. for details of these and other programs.

Educational Computer Programs
SHAPE International School
British Section, B.F.P.O. 26

115/4

NEWBRAIN

Quality software now becoming avalble.
Our first offering:

NEWBRAIN INVADERS

Completely authentic version of THE original video game. All features. Machine code of course. On cassette with full instructions. £5 incl. post/packing
More coming soon — games and serious applications. Details with order.

AA SOFTWARE
128 Beechcroft Road,
Wandsworth, London SW17

67/4

TWO NEW VIC BOOKS!

VIC GRAPHICS and VIC PROGRAMMES VOL 1

Both by Nick Hampshire. Publication dates 10.3.83 and 24.3.83 respectively. £6.95 each + 50p p&p or both for £13 + 70p p&p.
Send £4 to reserve. Send rest when ready for despatch. Send SAE for full details and our latest Sinclair catalogue.
Nick Lockyer
33 Pedmore Close, Woodrow South,
Redditch, Worcs., B97 7XB.

82/4

TEACH YOUR CHILD



to **Tell the Time**
and **Count Money**
on your Spectrum (16K)
Two Fun Graphics
Programs on Cassette
for £5.50 inc. p & p.

V. Sampson,
Richmond House,
Ingleton CARNFORTH,
LA6 3AN

Poppy Programs

35/3

VIC20 owners (any memory size). Introducing 'Tournament 1': Four exciting games on one tape. Only £3.95 inclusive. Enjoy Trogmen, Astradodge, Automania, Cross-over — all with excellent Sound, Colour, Music, Hi-Res Graphics. From Tournament Software, 63 Mansion Court Gardens, Thorne, Doncaster, S. Yorks. SAE for details.

144/4

Diet and weight control program for VIC 20 and CMB 64 helps and advises you on the best slimming diet. Cassette £12, disk £17. E. Frangoulis, 54 Holland Road, London W14 8BB.

46/3

BAUG SOFTWARE

Introductory offer ATARI 7½% off hardware up to 20% off Software. Commodore and Dragon. 10% off ZX81 keyboard £26.00.
Telephone 0232-621221 for details P.O. Box 123, Belfast BT10 0DB.

61/2

Wanted Urgently! Arcade-type games programs for micros — Spectrum, VIC 20, Dragon, Oric. We pay top royalties or cash outright for good exciting games. National marketing ensures maximum reward for your work. Phone David on 061 8329143 or write Northwish, Ground Floor, Ralli Building, Stanley Street, Manchester M35FD and hurry.

2/3

SYSTEM-SOFT

BBC PROGRAMS (Program Power)
TIMETREK (B)............JUST £7.95
STARTREK (A)............ONLY £5.95
Defeat the Klingons in the farthest quadrants of the galaxy.

SPECTRUM
CABMAN.......................£4.95
COWBOY SHOOTOUT...........£4.95

DRAGON 32
JOYSTICKS ONLY £19.95 pair.
Dragon software — please send S.A.E for lists.

All prices fully inclusive.

SYSTEM-SOFT
FREEPOST, Ackworth, Pontefract, West Yorks. WF7 7BR
(FREE catalogue with every new order!)

61/4

Superb Spectrum 3D Strategy Game, Multi-level, challenging, Machine Coded, Cassette, instructions, £4.95. Supersoft, 91 Manor Road, E17 5RY.

106/4

BBC (32K) PROGRAMS

SWOOP — Galaxian-style, arcade quality, m. code £7.95
ALIEN DESTROYERS — 'Invades' with extra features £7.95
GALACTIC COMMANDER — m. code, hi-res, good sound £7.95
LASER COMMAND — m. code, arcade quality game £7.95
CHESS — m. code, 6 levels, illegal moves rejected £7.95
Model A (16K) version available £5.95
All prices include p. & p.
Deduct £1 per tape for orders of 2 or more!

SYSTEM-SOFT
FREEPOST, Ackworth, Pontefract. W.Yorks., WF7 7BR
(Free catalogue with every new order!)

86/4

SPECTRUM SOFTWARE

- FLEXICALC - Versatile spreadsheet program, all usual features • you control number of rows & columns • edit your formulae at any time. Full manual. (48K only) 9-95
  Consolidation & report generator. 6-95
- FIGARO II - Business graphics • forecasting • statistics • fast data entry • data utilities. Powerful but easy to use. (48K only) 14-95

Saxon Computing

3, St. Catherines Drive, Leconfield, Beverley, Humberside.
Phone Access or Barclaycard orders to 0401-50697

120/4

MZ-80K Games £3, Extended BASIC £12, Disassembler £12. Catalogue SAE EDONSOFT, 33 Broadoak Road, Bramhall, Stockport.

98/4

Atari 400/800 secondhand software bought/sold. SAE for lists. Save 35% and more. Jervis 19 Portree Drive, Nottingham HG5 5DT.

139/4

48K ORIC games tape. Three great games on one cassettee: ONLY £3.00 including P&P. Send remittance to: S. Short, 20 Godwin Way, Bromham, Beds MK43 8JH.

136/4

BBC PRE-SCHOOL

4 programs making spelling & counting fun for 4 to 6 year olds.
Colour graphics and sound.
Model A and B versions.
£3.95 or S.A.E. for details.
AROSOFT, 136 Blackburn Rd, Chorley, Lancs. PR6 8TL 128/4

Battleships against Computer, simultaneous display of boards, ZX81 (16K), £4.25, Dragon, £5.50. Cheques to R. Simmonds, 2 Argus Walk, Crawley RH11 8BQ.

5/3

SPECTRUM EPROM CARD (£19.50)

Plugs into a Motherboard. (2 slot £16.95). Uses unused ROM space (14592-15615) and 2516/2716 (2K) and 2532 (4K) EPROMS. Tape Controller optional extra. (+£3.45).
Many possible uses including Special Char. Sets, M/C & BASIC. 6116 (2K) RAM+ADAPTOR (£9.95) plugs into ROM CARD. EPROM 31 (2K) (£9.95) programmed with RENUMBER (inc. GOTO, GOSUB, RESTORE, etc.). SPRITE Chars. printed from any start position, any magnification, rotated & reflected. WORD PROCESSOR for prepn. of TEXT with justification. UDG Char. Sets + many others.
Also available ZX81 EPROM-READ CARD (£8.75), EPROM 1 (with BREAKOUT, LIFE and TOOLKIT (£8.25), 2716 EPROM PROGRAMMER (£29.75), 25U P.S. (for Programmer) (£6.50). P&P £1 (U.K. only), £2 (overseas).
SAE please for extra details.
ORME ELECTRONICS
2 Barripper Rd., CAMBORNE, Cornwall

28/3

ATOM

'Devil Rider' machine code, 6K + 2K + sound. Ride your light cycle to victory over the computer or another combatant. Cassette £4.50.
Cheques to:
MOTA SOFTWARE
P.O. Box 68, Stevenage, Herts.

118/4

M & J SOFTWARE

Dragon Companion Book £4.95
Study the workings of BASIC with the disassembler.
Discover 7 extra graphics modes.
Take complete control of video memory mapping.
Increase the processor speed (not a hardware mod).
Append programs from tape.
Incorporate useful routines from BASIC in your m/c progs.
Add commands to BASIC.

Dragon Implementation of Forth. . . £15
This is a cassette based implementation and is fully documented.

Forth Listings................ £7
6502, 8080/Z80, 6809, 6800, 1802 in stock.

Installation Manual............ £5
Necessary for implementing FORTH and its editor.
All prices inclusive of postage and packing. Cheques and POs made payable please to:

M & J SOFTWARE
34 Grays Close, Scholar Green, Stoke-on-Trent, ST7 3LU
Tel: (0782) 517876

68/4

DEATH'S HEAD HOLE

You'll almost believe it's true!

It's skill, courage and your growing experience that count in this unique adventure for the Dragon 32 and BBC Model B, inspired by the real-life challenges facing a cave rescue team.

Literally hours of excitement — if you measure up.

After this, any other adventure will just be a game.

Only £5.45 by return of post from

WORDS AND PICTURES
7 Hawthorn Crescent, Burton-on-Trent

4/3

ORIC-1 OWNERS Tangerine created Oric-1 now TUG creates the rest. An independent Users Group with a solid reputation for progressive system support. Monthly Newsletters, Software, Hardware, Reviews, Advice, and lots more. We have a proven record of performance on our system. Join TUG. You'll like us, we do! Send £1.00 + S.A.E. (A4) for sample newsletter and details. Tangerine Users Group, 1 Marlborough Drive, Worle, Avon, BS22 0DQ.

56/3

BBC (32K) SPECTRUM (48K)

NEW RELEASES
INVISIBLE MAN — now for Spectrum! Also for BBC and VIC20 £5.95.
STORY A — BBC only — just like a story book, but you choose the plot. Ages 7-11 £6.95.
PUNC-MAN — BBC only — he gobbles the full stops. You put them back! £7.95.
REAL EDUCATIONAL PROGRAMS

chalksoft
SAE for details—
Lowmoor Cottage (YC4), Tonedale, Wellington, Somerset TA21 0AL.
082 347 7117

11/3

Acorn Atom 12K+12K, P.S.U. programme power toolkit R.O.M., Software, Books £150 01-399 3203.

147/4

x SCOTSOFT x

Quality educational software for SPECTRUM (16K-48K) & BBC (16K-32K).

TIME £7.50
Teaches children to tell the time in easy steps suitable both home and classroom hi-res colour graphics.

TRANSFORM £7.50
Comprehensive programme includes translation, reflection, rotation etc. Demonstration & remedial routines suitable home & classroom sound & Hi-res colour graphics.

MUSIC £7.50
Simple & convenient aid to learning music in home or classroom, enter any tune from music hear how it should sound, vary tempo to make follow staff easy.

DISASSEMBLER £7.50 (BBC only)
Super fast M/C full colour, hexdump, Ascii characters printed Neumonic listing, branch calculation, printer facility.

3 FLEMING ROAD, BISHPTON, RENFREWSHIRE, P.A.7 5HW.

152/4

Spectrum Programming. Learn Basic Programming the easy way with our fully structured cassette course. Let the computer teach you! 250K of programs ending with a computerised exam. Only £9.95, Barclaycard accepted. Sussex Software, Wallsend House, Pevensey Bay, Sussex.

55/2

BBC Micro A/B Users. Operate your own Teletext compatible information service of up to 9/25 on-line pages with real-time date and clock. Ideal for shops, offices, public institutions, educational establishments etc. The Viewtext package comprises two interactive programs for page creation and display, comprehensive user guide and demonstration pages. Cheques/POs for £9.95 or SAE for details to IT Services, 27 Waterford Park, Radstock, Avon, BA3 3TS.

45/3

ATARI owners make back-up copies of your single boot tapes, with Cassclone £8.00 only. Pat Nevison, 162A High Road, Streatham, London SW16. Despatched by return.

169/4

UP TO 30% ROYALTIES

paid for high quality original software
BBC, SPECTRUM, DRAGON 32, PET, RML380Z
Games and Educational programs

WANTED URGENTLY

SILVERLIND LTD.
156 Newton Road, Burton on Trent, Staffs DE15 0TR

109/4

AT LAST! BBC MICRO GRAPHICS PAD

FANTASTIC VALUE!

A high quality, cartridge paper pad featuring Graphics, Teletext screens and user-defined cells. Plus easy reference commands sheet. All for an incredible £2.59+65p p&p.

Hermes Computer Products Dept YC3
10 Barlow Moor Close, Norden, Rochdale, Lancs. OL12 7RN

123/4

Vic-20 unexpanded games. Breakout, Deep Space, Space Chase, Rocket Command, Subterranian, Mazing, Simon Said, Defence. All eight for only £6.95. P. Sigsworth 16, Avenue Terrace, Starbeck, Harrogate, N. Yorks.

94/4

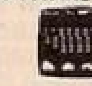
MAKE MONEY

out of your hobby. We urgently require quality original games and educational software. Top rates paid for new and novel ideas. Write to:
SMT (Trading)
4 Bengall Lane, Greens Norton, Towcester, N'hants. NN12 8BE

60/4

BBC

MODEL B SOFTWARE



INVADERS	£5.95
GALAXIANS	£6.95
CENTIPEDE	£6.95

FREE P&P — 48hrs DELIVERY
Cheques & PO's to SRM
SRM
542 Manchester Rd
Bury Lancs BL9 9PA

78/4

Dragon 32 Fruit Machine, and Spelling Test. Both £2.95. Eladon Software, 32 Lansdowne Close, Tiptree, Essex, CO5 0NT.

119/4

NAZCA SOFTWARE

ZX81 16K ZX Spectrum 16/48K

Superb Software for the ZX Printer.
Programs include: Word processor, cassette labeler, Hex-dec/Dec-hex converter, Paint on the Spectrum and more to come.
All programs in clear modular Basic. Easy to adapt to your own needs. We provide help if needed.
Each program on cassette £3.95 inc. p.&p. comes with a user manual and is fully documented.
All orders for Nazca Software are sent by first class return mail.
Send s.a.e. for details by return post to:
NAZCA SOFTWARE
42 Ashgrove Road, Goodmayes, Essex. JG3 9XD
Telephone: 01-590 1486

104/4

FREE

4 page leaflet on tape head azimuth alignment . . . if you order any product (misalignment can cause loading problems)

- TEST CASSETTE to set up head azimuth & tape speed, includes instructions: mono or stereo £4.90.
- HEAD DE-MAGNETISER, cassette size, mains operated, removes residual magnetism £4.75.
- ZX LOADING AID for **ZX80, ZX81 or ZX Spectrum.** Removes guesswork adjusting volume, plugs between computer & recorder. Red and Green LED's on — optimum volume set; Red LED (only) on — volume too low; yellow LED on — volume too high. Includes instructions. Standard (EAR & 9V leads only via loading aid) ZX80 or ZX81 £11.95 ZX Spectrum £12.20. De-luxe (EAR, MIC & 9V leads + load/save switch) ZX80 or ZX81 £15.70 ZX Spectrum £15.95; Push-button reset "K" cursor standard or de-luxe £1.50 extra; Earphone "Voiceovers" standard or de-luxe £1.50 extra.
- Protect your computer with high quality washable DUST COVER: **ZX81, ZX Spectrum, ORIC-1, Jupiter ACE** or **NewBrain** £1.95; **LYNX, DRAGON 32, ATARI 400 or 800, VIC 20 or 64** £2.95; **BBC-A or B, COLOUR GENIE OR TEXAS TI99/4A** £3.95; **SHARP MZ80A-K** £4.95; Available for most other micros, monitors, disc drives & printers.
- Flat ribbon cable suits "other keyboard" to **ZX81 or ZX Spectrum** interconnection (require 5 way & 8 way) available any length maximum 19 way 1p per 10mm (e.g. 100mm of 5 way = 50p). ZX81 & ZX Spectrum keyboard connectors 5 way 95p ea.; 8 way £1.05 ea.
- **LYNX** parallel expansion connector + push-button to reset computer £4.95.
- **ZX81** flexible RAM pack connector solves wobble problems £14.95.
- A3 size pad 100 Program Design Sheets suit **any computer** £7.95; A3 size pad 100 High Resolution Graphic Planning Sheets **DRAGON 32** £7.95.
- **ORIC-1** leads DIN to DIN or DIN to jacks £3.20; **TEXAS TI99/4A** leads single £7.20 twin £11; **DRAGON 32** leads 5 pin DIN to DIN & jack or 3 jacks £3.20; **BBC A or B** leads 7 pin DIN to DIN & jack or to jacks £3.20.
- Books: "VIC Programmes" £7.95; "VIC Graphics" £7.95; "VIC Revealed" £10.95; "Spectrum Graphics" £7.95.
- T-Shirts £3.50 Sweatshirts £7.50 Black with Red "**Sinclair ZX81**" or White with Black "**ZX Spectrum**" + 4 colour rainbow. Very popular individually hand air-brushed multi coloured designs Black T-shirts £4.50 & Sweatshirts £9.00 "**I'M A MICRO ADDICT**" with: hands on micro, or "**MICROCOMPUTERS TAKE YOU INTO ANOTHER WORLD**" against space scene with astronaut. Chest sizes available 24" to 44".
- **ZX81** KEYBOARD BLEEPER provides feedback. All 210 characters bleep in SLOW & FAST. Fits inside — no soldering all connections plug-in. Instructions included £10.95 ON/OFF Switch £1.70 extra.

PLEASE SEND S.A.E. FOR FURTHER DETAILS. ALL PRICES INCLUDE P&P (UK only).

MAIL ORDER WITH PAYMENT & REQUIREMENTS CLEARLY SPECIFIED TO: DEPT. YC1.

FULCRUM PRODUCTS
14 STEEP LANE, FINDON, WEST SUSSEX BN14 0UF
Tel: Findon (090 671) 2550

146/4

The Pirate. Now you can make back-up copies of any machine code program. The only restriction is that there must be enough user RAM for both programs, though Pirate takes up little memory, Spectrum cassette only £5.50 from A.J.R. Heading, 38 Frogston Road, West Edinburgh EH10 7AJ. A worthwhile investment.

112/4

Really hear your Spectrum beep with an amplifier. In stylish black case to match Spectrum, with volume control. No soldering, just plugs in. Send £7.95 inc. P&P to: M. Snowball, 127 Tonbridge Road, Maidstone, Kent.

117/4

DAI/48K computer. 24K-ROM, Hi-Res colour graphic, Stereo Music Generation, Pascal, S. Chess, etc. £280. Horsham 65832.

92/4

ZX81 (16K)
SPACE SHUTTLE GAME

Fly your shuttle from planet to planet, but mind how you go, and watch your fuel, also includes 2 other games £4.95 P&P.

SIGMA SOFTWARE,
43 SEDGEFEN, BRANDON, SUFFOLK

160/4

Dragon Software: Bunkers, defend your cities from death rays and aliens: Tank-battle, shoot over a mountain, destroy your opponent. Together for £5.95 plus 50p P&P. Alton; 21 Crossbanks, Shipley, West Yorkshire BD18 3RW. Lists. SAE.

114/4

ZX81 16K Software, Vector Maths, Statistics, 'A' Level Maths £4.50 each. English literature 1 and 2 £1.95 each. Music £1.95. S. Ahmed, 45 Elmwood Road, Croydon CR0 2SX.

89/4

NOTICE

I, Mr T. Jevon admit that I have infringed the copyrights in Ultraviolet, Infrared and Nightflite and that I have now stopped trading in all software.

140/4

Spectrum Defender, Galaxians and Missile Command on one cassette featuring colour and sound. £5 to A. Shaw, 8 Yeadon Drive, Southowram, Halifax, West Yorks.

90/4

IK ZX81 MAZE GUZZLER

At last — a full feature IK version of the famous arcade game.

- SMOOTH, FAST MACHINE CODE
- INTELLIGENT MONSTERS
- ENERGY PILLS
- ON SCREEN SCORING
- SPEED-UP ACTION

On tape with 'SUPER BREAKOUT' £3.50

SELEC SOFTWARE
37 COUNCILLOR LANE
CHEADLE, CHESHIRE
061-428 7425

148/4

BBC, DRAGON 32 owners — top quality computer covers, manufactured from good looking, durable vynide, in complementry colours. Cheques/P.Os for £2.95 to C. Ryan, 27 Denison Road, Hazel Gove, Stockport, Cheshire, SK7 6HR.

155/4

ZX81, US Distributor seeks to obtain ZX81 software and related products for distribution in USA. Inquiries to W. Hettinger, 3 Laurel Ridge, Tolland, CT 06084, USA.

126/4

Spectrum 16K/48K, the classic 'Battleships' and 'Escape From The Crypt', a new adventure game. Full Graphics. Both games on one cassette for £5. R. Acton, 44 Beehive Lane, Basildon, Essex.

18/3

V20 — COM CLUB — VIC 20 Software club hire your tapes or cartridges. COM CLUB Membership fee £9.00, Cassette £1.00, Cartridges £3.00. Send no money now, for membership form, order form and free catalogue to: COM CLUB, 24 Alton Rd, Aylestone, Leicester.

157/4

DRAGON 32 BBC MODEL/B TRS80 C/C 32K

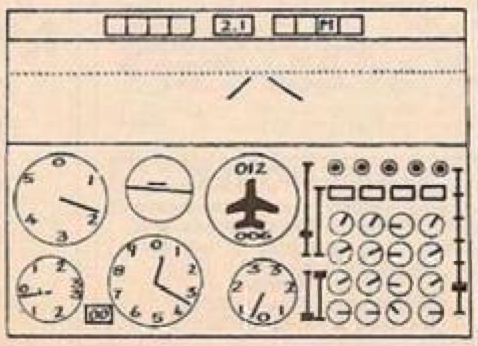
747 FLIGHT SIMULATOR

Superbly realistic instrumentation and pilot's view in lifelike simulation which includes emergencies such as engine fires and systems failures. This program uses high resolution graphics to the full to produce the most realistic flight-deck display yet seen on a home computer. There are 21 real dials and 25 other indicators (see diagram). Your controls operate throttle, ailerons, elevators, flaps, slats, spoilers, landing gear, reverse thrust, brakes, etc. You see the runway in true perspective. Uses joysticks and includes options to start with take-off or random landing approach. "A real simulation, not just another game." (Your Computer Apr. 83).

Cassette £9.95 (P&P and VAT included)

D.A.C.C. Ltd (Dept YC)
23 Waverley Road, Hindley,
Gtr. Manchester WN2 3BN

154/4



WANTED URGENTLY

Arcade-type games programmes for Spectrum, Vic20, Oric, Dragon, BBC Micro and Lynx. We pay top royalties or buy your copyright for cash. National mail order and dealer sales ensure you get the best reward for your genius.

Write or call into

NORTHWISH LTD
THE GROUND FLOOR, RALLI BUILDINGS
STANLEY STREET, MANCHESTER
M3 5FD
or Phone 061-832 7049



151/4

We Pay Hard Cash for Software

• IMMEDIATE DELIVERY •

SPECTRUM

MICRO IQ
BECOME AN EXPERT IN COMPUTER KNOWLEDGE
9 PROGRAMS (OVER 100K)
1,000 MULTI-CHOICE QUESTION/ ANSWERS.
LEARN RARE POKES
IMPROVE YOUR PROGRAMMING.
M/CODE & BASIC 16/48K

Hi-res. Colour Sound etc.
£5.00
Send Cheque/P.O. to:

M.K. CIRCUITS
36 St Ives Crescent
Grimsby DN34 5SJ

133/4

Video Genie, 16K, Sound, Hitachi Monitor, over 200 programs, (include Galaxians, Scramble, Firebird, Bezerk, Asteroids). £350 o.n.o. Tel: Luton 505180 evenings.

131/4

COMPUNTA IS HERE!

A serious programme that is simple to use.

Put your micro to work doing what it's best at — processing information.

Using my **COMPUNTA** Race selection programme, covering meetings at 34 Courses you should be backing winners fairly frequently.

Then at the end of the flat season, return the tape and I will send you a completely new Compunta Programme, up-dated for the N.H. season.

But that's not all, I also offer this unbeatable guarantee — If at the end of the flat race season you are not completely satisfied with the performance of the programme, return it for a refund of your money.

Send just £9.95 (inc. P&P 95p) for Dragon, Spectrum (48K), Tandy Colour (32K) Machine.

ROD CROOKES
72 Lambert Road, Grimsby
DN32 0NR

150/4

BBC A/B adventures: All types, all levels, from £3.50. SAE 30 Grasmead Avenue, Leigh-on-Sea Essex.

137/4

Chemistry Exams? No problem with Alchemy Software. 6 programs each with extensive notes covering formulae, calculations for O/CSE for ZX81 and Spectrum. Send SAE for details. 78 Tweendykes Road, Hull.

142/4

SOFTWARE SAVACENTRE

48 page COLOUR guide of over 500 items of Software/Hardware for Atari, Dragon Spectrum, VIC 20 & 64 all at Discount Prices. Send £1 now (refunded on 1st order) to:— **6 Brooke Ave, West Boldon Tyne and Wear, NE35 9ES.**

153/4

SPECTRUM RENUMBER/DELETE. Machine Code program which renumbers GOTO, GOSUB, RESTORE, LINE, LIST, RUN. Also Block Delete, selective deletion of REM statements, PRINTS Memory available. 16/48K. £3.95 from AWA, 50 Dundonald Road, Didsbury, Manchester.

145/4

We are seeking good quality, original, de-bugged games, utility, business & educational programmes for the ZX81 (1K-16K) & Spectrum (16K-48K).

We are offering an attractive remuneration package for the right programmes.

Write to us at:

Dial Grove Ltd
10a James Street,
Covent Garden, London WC2

You will be pleasantly surprised by our approach.

149/4

Spec-Copy back up copies all Spectrum programs/machine code. £3.95 for cassette Mike Lamb, 5 Potterdale Drive, Little Weighton, Humberside.

156/4

Bored with your present software? Then swap with our fast, reliable service, send S.A.E. to 25 Hillman Close, Bracebridge Heath, Lincoln.

138/4

Atom + BBC
Software wanted
excellent royalties paid.

Send an S.A.E. to:

243 Sutton Road,
Mansfield, NG18 5HR

141/4

MZ80K/A Horserace Analysis. Winners galore. Cassette £5.75. Other Sharp program from £3. Details: Paragon "Moorside" Woodlands, Wimborne, Dorset.

143/4

ATOM PROGRAM AIDS

£15.95 each (incl VAT)

TWODIL BOARD
Enables two EPROMS to be switch-selected. Plugs into IC24 on the ATOM via ribbon cable.

UTILITY ONE
A machine-code montior for the ATOM. Includes; Disassembler, Transfer memory, Registers, Fill memory, Prom-programmer routine.

BETER ELECTRONICS
(Dept YC)
58 MILL ROAD AVENUE
ANGMERING VILLAGE
SUSSEX BN16 4HS
TEL: 09062 72833

135/4

reprints

If you are interested in a particular article/special feature or advertisement in this journal

HAVE A GOOD LOOK AT OUR REPRINT SERVICE!

We offer an excellent, reasonably priced service working to your own specifications to produce a valuable and prestigious addition to your promotional material. (Minimum order 250 copies).
Telephone Michael Rogers on 01-661 3457 or complete and return the form below.

To: Michael Rogers, Your Computer, Reprint Department, Quadrant House, Sutton, Surrey SM2 5AS.

I am interested in .... copies of article/advert.

headed .... featured in this

journal on pages ...., issue dated ....

Please send me full details of your reprint service by return of post.

Name ....

Company ....

Address ....

.... Tel. No ....

APPOINTMENTS


CAN YOU FILL
THIS
SPACE ?
ARCADE
ACTION
SOFTWARE PROGRAM
WRITERS
If you can fill this space with one of your own programs written on one of the following models: SPECTRUM ZX81, VIC 20, DRAGON, ATARI, BBC and any other makes of home computer, and wish to work with one of Great Britain's most progressive companies then ring David Heelas, for an early discussion.
Unit 2, Shire Hill Ind Est, Saffron Walden, Essex CB11 3AQ
Tel: (0799) 22359/26350 (24 hrs)
dk'tronics

124/4

WANTED PROGRAMMERS

Right Now! TITAN are looking for young dynamic and enthusiastic freelance programmers to enhance their already established range of arcade quality software for most types of home computer systems (e.g. Spectrum, Vic, Atari, Oric).

If you feel that you fit these requirements and have a sound knowledge of machine language then waste no more time; write in the strictest confidence to Titan Programs Development Dept., The Computer Palace, 46 Market Place, Chippenham, Wiltshire, SN15 3HU.

What was once a hobby could be the start of a career that could change your life!

TITAN PROGRAMS

108/4

SELL IT WITH YOUR COMPUTER

CLASSIFIED ORDER FORM

Classified Rates

Linage: 30p per word (Min 15 words) – prepayable

Linage advertisers should complete the form provided in BLOCK CAPITALS. Phone number counts as 2 words. Name and address to be paid for if used in advertisement. Box Number if required is £3.00 extra.

Display – rates per scc (Min 2scc)

One Insertion	:	£7.00
Three Insertions	:	£6.70
Six Insertions	:	£6.50
Twelve Insertions	:	£6.00

Display advertisers should provide separate copy and preferably reserve space by phone (01-661 3036).

Method of Payment

Cheques etc, should be made payable to Business Press International Ltd, and crossed. I enclose herewith cheque/PO for

£.......................

Please debit my Access/Visa Barclay Card/American Express/Diners Club Int/ as below

SIGNATURE

Post to:

Cut out the order form and return together with your remittance to: Classified Department, Your Computer, Room H211, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. (01) 661 3036

Please insert the following advertisement in Your Computer Classified Section

				LINAGE
				£4.50
				£6.00
				£7.50
				£9.00
				£10.50
				£12.00
				£13.50
				£15.00

No. of insertions required ☐ Box No. required YES/NO

NAME *(Please include initials)*. ....

ADDRESS ....

....

....

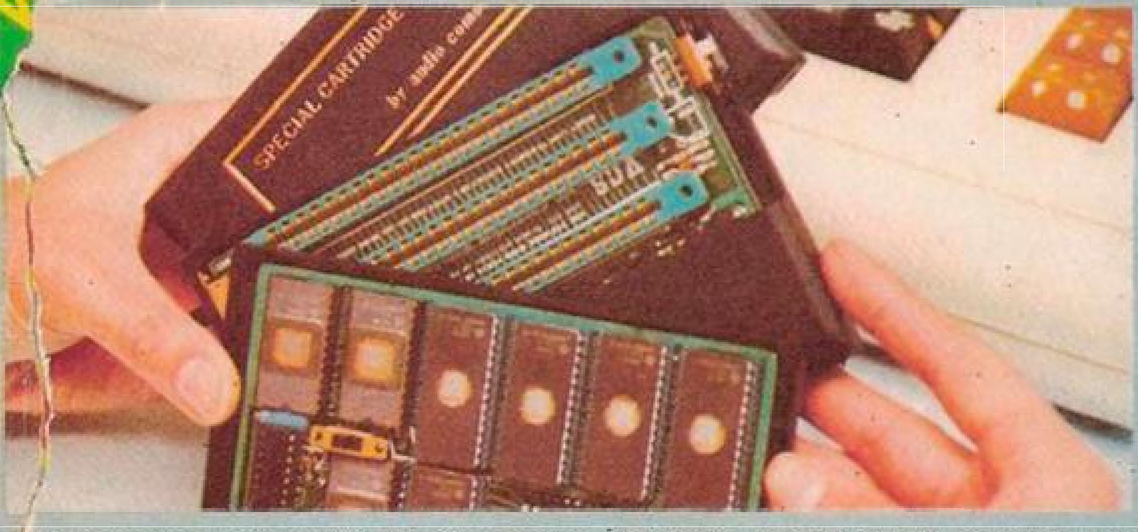
Payment by credit card please state address card is registered

Daytime tel. no ....

THIS FORM SHOULD BE RETURNED BY MAY 3 FOR JUNE ISSUE PUBLICATION

Company Registered Number: 151537 (England) Registered Office: Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

THE INTEGRAL EXPANSION SYSTEM FOR VIC 20



THE SRC 16 The first cartridge to consider for your VIC 20

- It's a direct replacement for the Commodore 16K RAM cartridge but it's no ordinary cartridge
- It has space for the 40 column ROM or a programmer's toolkit ROM
- It has space for a cartridge slot, accepting any Commodore cartridge
- It has space for an extra 16K bytes of RAM, making a total of 37½K (28159 bytes free for basic, 8192 bytes for machine code or game simulation)
- It's part of a complete system including motherboard, Eprom programmer, 16 bit second processor, etc. and is available at many computer stores and in most European countries
- It's designed, manufactured and fully guaranteed for 6 months by:

THE INTEGRAL EXPANSION SYSTEM FOR VIC 20
SOLIDISK TECHNOLOGY LIMITED

STL

SOLIDISK TECHNOLOGY LIMITED

COMPUTERS PERIPHERALS MICROPROCESSOR DEDICATED SYSTEMS
Tel: (0702) 618144/613081 Trade Name: AUDIO COMPUTERS
87 Bournemouth Park Road Southend-on-Sea Essex SS2 5JJ England

IF YOU'VE ALREADY GOT A SINCLAIR RAM PACK, ALL IS NOT LOST!

The Fix-A-Ram offer is for you.

STOP THE RAMPACK WOBBLING for only **£0.50** post and packing included

Program crashes on the ZX81 are only too well known, but one of the most common reasons is '*wobbling*'.
The *Sinclair Ram Pack* is attached to the computer by a small contact area, as shown in figure 1.
We have designed what is much needed: a *plastic sleeve*, which is sandwiched discreetly between the Ram Pack and the computer, called the *FIX-A-RAM* (see fig. 2).
RESULT: *a perfect match and stability*.

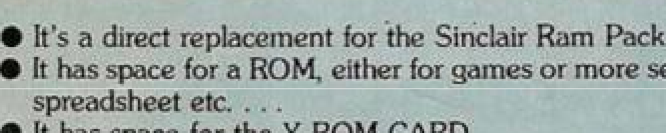


Fig. 1



Fig. 2

IF YOU'RE LOOKING FOR A 16K RAM PACK,



The Special Ram pack is for you!

THE MOST PRACTICAL SYSTEM FROM: £19.95 ONLY.

- It's a direct replacement for the Sinclair Ram Pack, but it's no ordinary Ram Pack!
- It has space for a ROM, either for games or more serious applications such as electronic spreadsheet etc. . . .
- It has space for the X-ROM CARD
- It has space for a keyboard sounder
- It doesn't wobble!

Available from Solidisk Technology Ltd. at the above address.

SINCLAIR ZX 81 EXPANSION SYSTEM
SOLIDISK TECHNOLOGY LIMITED 87 Bournemouth Park Road, Southend-on-Sea, Essex SS2 5JJ Tel: 0702 613081

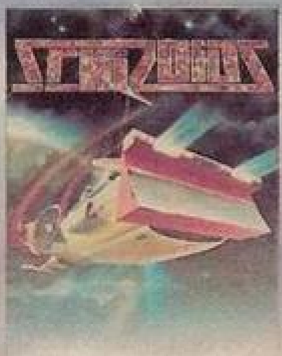
Item	Qty	Price Inc VAT	Total
FIX-A-RAM for Sinclair Ram Pack		£ 0.50	
16K Special RAM PACK		£19.95	
Optional keyboard sounder		£ 2.50	
Optional compiler ROM		£10.00	
Postage and packing		£ 1.00	£ 1.00
		TOTAL £	

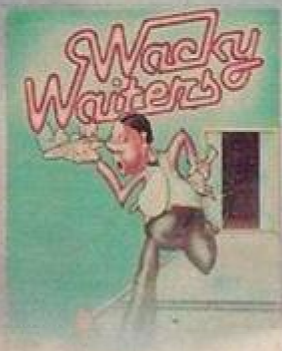
Please charge my Access, Barclay account:

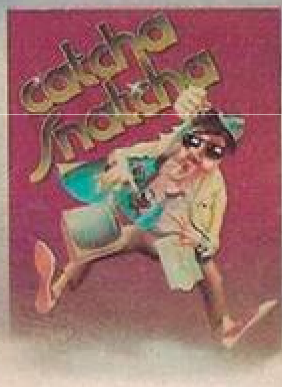
*Please delete/complete as applicable
*I enclose a cheque/ P.O. payable to: SOLIDISK TECHNOLOGY LTD for £

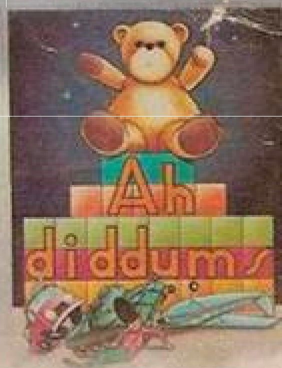
NAME
ADDRESS

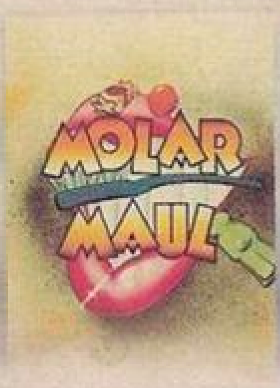





Wacky Waiters


catcha snatcha


Ah
diddums


MOLAR
MAUL


MORE ALIENS!!!
DON'T PANIC!
FRANTIC

4H 901